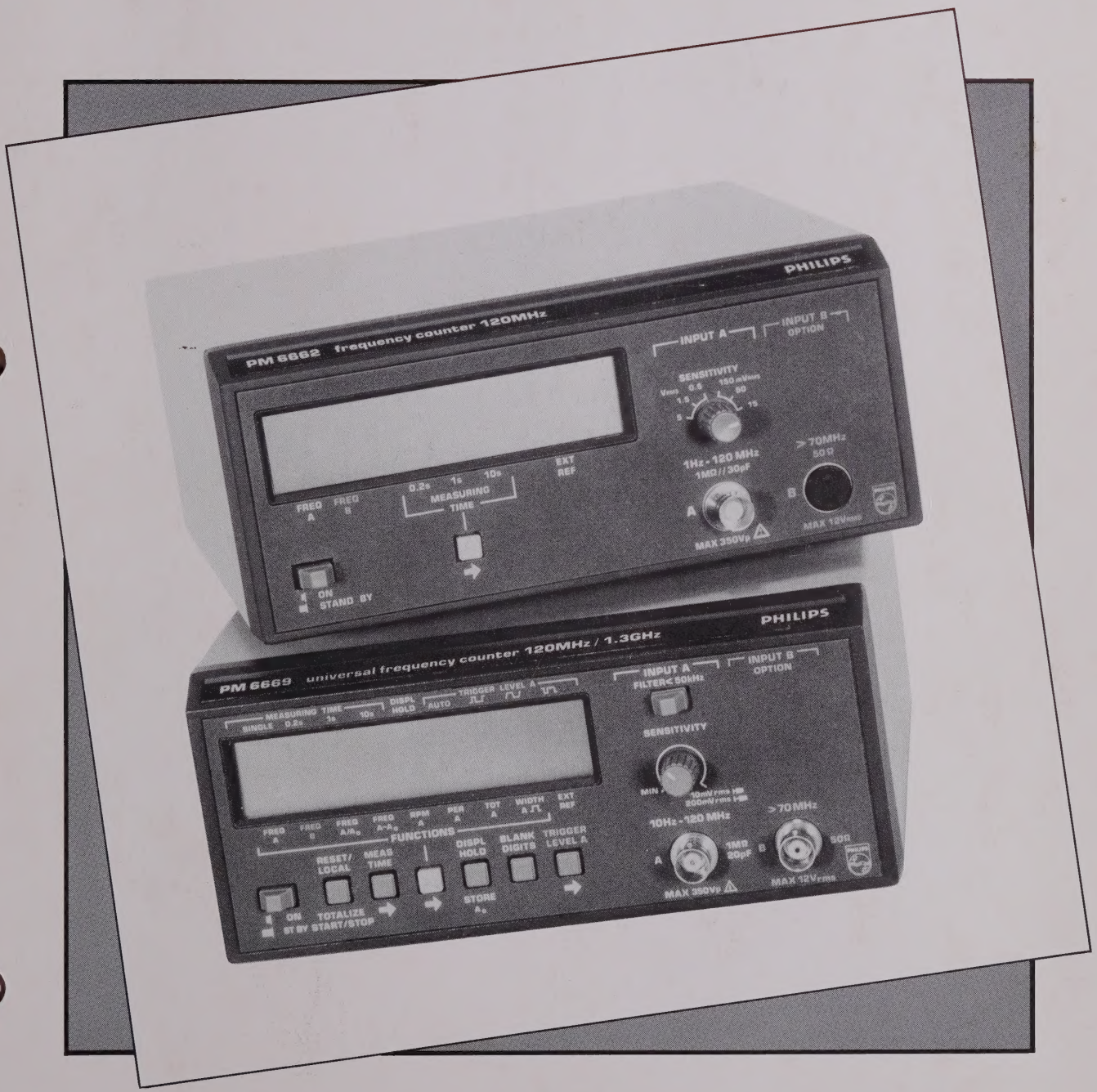
PHILIPS

Frequency Counters
PM 6662 and PM 6669

Service Manual

TEST & MEASUREMENT – CUSTOMER SUPPORT



9499 465 01411
89-06 First edition

Important

As the instrument is an electrical apparatus, it may be operated only by trained personnel. Maintenance and repairs may also be carried out only by qualified personnel.

Please note

In correspondence concerning this instrument, please quote the type number and serial number as given on the type plate.

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Printed in Sweden.

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INTRODUCTION

This Service Manual supports the Philips PM 6662 Frequency Counter and PM 6669 Universal Frequency Counter.

Information valid for only one of the types is followed by the type number within parentheses.

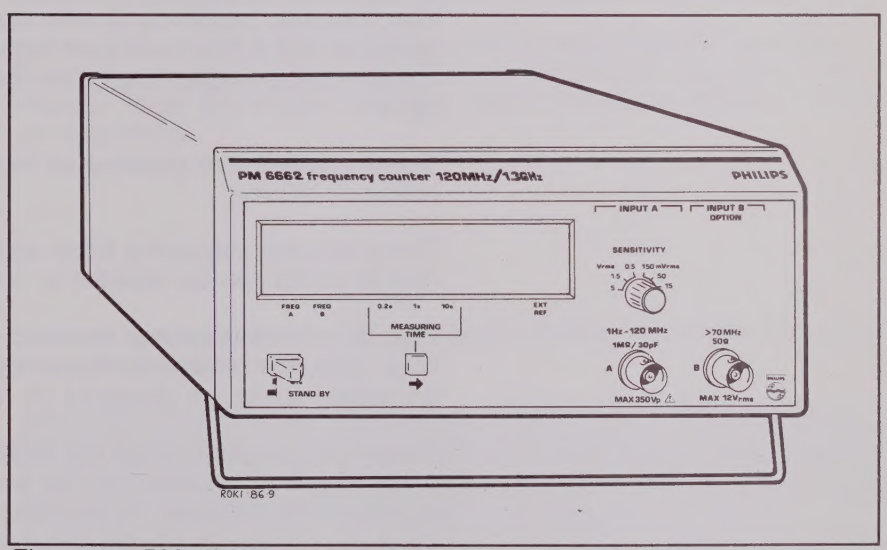

Figure 1. PM 6662.

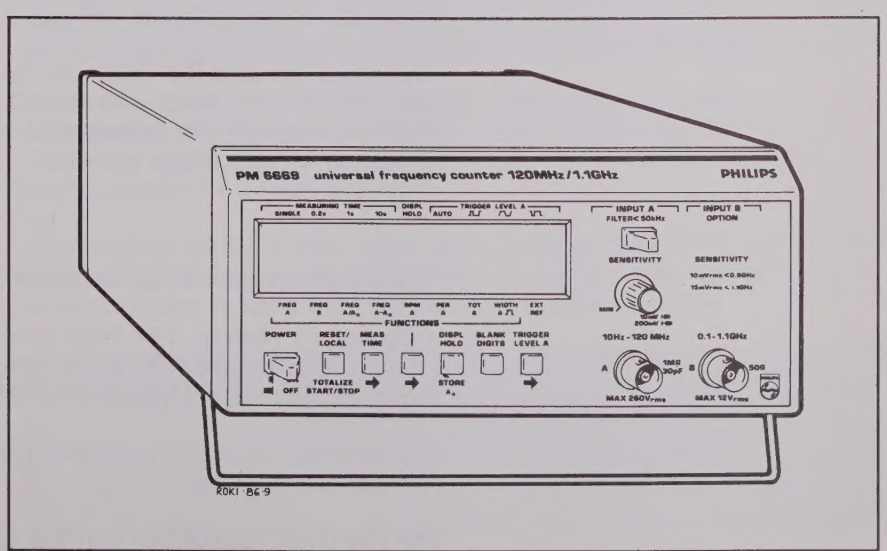

Figure 2. PM 6669.

The Philips PM 6662 and PM 6669 Frequency Counters are bench type portable Reciprocal Frequency Counters. They can make following types of measurement:

- Frequency up to 120 MHz.
- Frequency up to between 1.0 and 1.3 GHz depending on version (option).
- Revolutions per minute (PM 6669).
- Period measurements (PM 6669).
- Pulse totalizing between two manual presses of a button (PM 6669).
- Pulse width (PM 6669).

The measurement input A is AC coupled, and it has an input impedance of 1 Mohm. The PM 6662 Counter contains a 6 step input attenuator. The input circuitry of the PM 6669 contains a 2 step attenuator and potentiometer sensitivity control.

The optional HF input B has an input impedance of 50 ohm and an automatic attenuator.

The reference frequency is generated by a very stable 10 MHz crystal oscillator and if you need even higher stability a mathematically temperature compensated crystal oscillator (MTCXO) is available as an option.

The instrument also provides an input for an external frequency reference source.

Three different measuring times and for PM 6669 also a single cycle measurement can be selected to obtain different resolution.

Results of measurements, selected function (PM 6669), measuring time, presence of external frequency reference, and for PM 6669 also the trigger levels are displayed on a nine digit LCD display.

The major functions of the PM 6669 counter, such as function and measuring time selection can be controlled by a computer via an optional GPIB interface. In this case a "REMOTE" indicator is switched on at the display to indicate that some front panel controls are disabled.

A rack mount adapter for 19" racks is available as an option.

The PM 6662 and PM 6669 can be powered by 110...115 V or 220...240 V - 50, 60 or 400 Hz AC line voltage. For field use, the optional rechargeable battery pack and a carrying case allows operation without mains power.

The documentation of these instruments comprises:

- Operator's Manual, PM 6662 (one volume).
- Operator's Manual, PM 6669 (one volume).
- Service Manual, PM 6662 and PM 6669 (this volume).

For servicing an instrument both Operator's Manual and Service Manual are required.

For PM 6669, completed with the GPIB interface, there is a pocket guide with short form information about GPIB commands.

SAFETY INSTRUCTIONS

WARNING: These servicing instructions are for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that specified in the Service Manual unless you are fully qualified to do so.

Authorized service and calibration of these instruments is available worldwide. A list of service centers is printed on the last page of this manual. Read this chapter carefully before you check, adjust or repair an instrument.

Caution & Warning Statements

You will find specific warning and caution statements where necessary throughout the manual.

CAUTION: indicates where incorrect operating procedures can cause damage to, or destruction of, equipment or other property.

WARNING: indicates a potential danger that requires correct procedures or practices in order to prevent personal injury.

These Frequency Counters have been designed and tested in accordance with IEC publication 348, Safety Requirements for Electronic Measuring Apparatus for class 1 instruments, and have been supplied in a safe condition.

This manual contains information and warnings that should be followed by the user and the service technician to ensure safe operation and repair in order to keep the instrument in a safe condition.

WARNING: The opening of covers or removal of parts, except those to which access can be gained by hand, is likely to expose live parts and accessible terminals which can cause death.

The instrument must be disconnected from all voltage sources before it is opened.

Remember that the capacitors inside the instrument retain their charge even if the instrument has been disconnected from all voltage sources.

Grounding

These instruments are connected to ground via sealed three-core power cables, which must be plugged into socket outlets with protective ground contacts. No other method of grounding is permitted for these instruments. The ground symbol on the rear panel indicates where the protective ground lead is connected inside the instrument. Never remove or loosen this screw.

When the instrument is brought from a cold to a warm environment, condensation may cause hazardous condition. Therefore ensure that the grounding requirements are strictly met.

Power extension cables must always have a protective ground conductor.

WARNING: Any interruption of the protective ground conductor inside or outside the instrument, or disconnection of the protective ground terminal, is likely to make the instrument dangerous. Do not intentionally disrupt the protective grounding.

Line Voltage Setting

Before connecting an instrument to the line, ensure that it is set to the local line voltage. On delivery the instrument is either set to 115 V or 230 V as indicated on the line voltage selector on the rear panel. If the line voltage setting is incorrect, set the line voltage selector in accordance with the local voltage before connecting the instrument to the line. See Operators' Manual.

Replacing Components in Primary Circuits

Components that are important for the safety of these instruments may only be renewed by components obtained from your local Philips organization. After repair in the primary circuits, perform the safety inspection and tests, as described in the chapter *"Repair"*.

Fuses

These instruments are protected by thermal fuses inside the transformers. If a transformer has been hot enough for a fuse to blow, the complete transformer will be unsafe and must be replaced. An ordinary fuse protects the battery option. If this fuse must be replaced, use a 20 x 5 mm 1.6 A slow blow fuse.

QUICK FAULT-FINDING

These instruments are highly integrated counters with dedicated LSI counter circuits and microcontrollers that control the complete units. Providing the microcontroller works correctly it can help you to locate faulty parts by running test programs and generating stable patterns on the bus. If the microcontroller does not work or the fault is in a part of the counter that cannot be accessed by the micro-controller, traditional faultfinding must be performed.

Where to Start

After reading the safety instructions, start by performing the checks in the chapter on *"Function Check".* These tests can be performed without dismantling the instrument. With the results of the function checks at hand, turn to the chapter on *"Repair"* for fault-finding and repair instructions. When the instrument has been fixed, always do the safety inspection and test after repair, as described in the chapter *"Repair",* then do the checks in the chapter *"Performance Check".* Recalibrate if required by following the adjustment instructions in the chapter *"Adjustments".*

Instruments Required

To be able to test the instrument properly using this manual you will need the equipment listed below. The list contains not only suggested Philips and Fluke test equipment, but also the critical parameter specifications required if you have instruments from other manufacturers.

Equipment type	Specifications	Suggested type No.
Adapter BNC banana		Philips PM 9051 or Fluke Y9109
Adjustable power supply	min. 6 V DC	Philips PE 1537
Attenuator	20 dB attenuation	Fluke Y9102
BNC T-piece		Philips PM 9067 or Fluke Y9107
Digital multimeter	0-250 V AC, 0-10 V DC	Philips PM 2518 or Fluke 77
Frequency reference	10 MHz, accuracy $3x10^{-8}$	Philips PM 9691
HF signal generator	1300 MHz	Fluke 6070A or Wavetek 2002A
LF oscilloscope	DC-10 MHz/10 mV	Philips PM 3215
LF synthesizer	2 MHz	Philips PM 5190
Oscilloscope	min. 350 MHz	Philips PM 3295
Probe	10 Mohm input impedance	Philips PM 8922
Pulse generator	50 MHz	Philips PM 5786
Resistor	1 ohm, 0.5 W	
Resistor	100 ohm, 0.5 W	
Room thermometer		
Screwdriver		ELCOMA 4822 310 50015
Termination	50 ohm, 1 W	Philips PM 9585 or Fluke Y9317

How to Replace Surface Mounted Devices

Most of the components in this instrument are mounted on the surface of the board instead of through holes in the board. These components are not hard to replace but they require another technique. If you do not have special SMD desoldering equipment follow the instructions below:

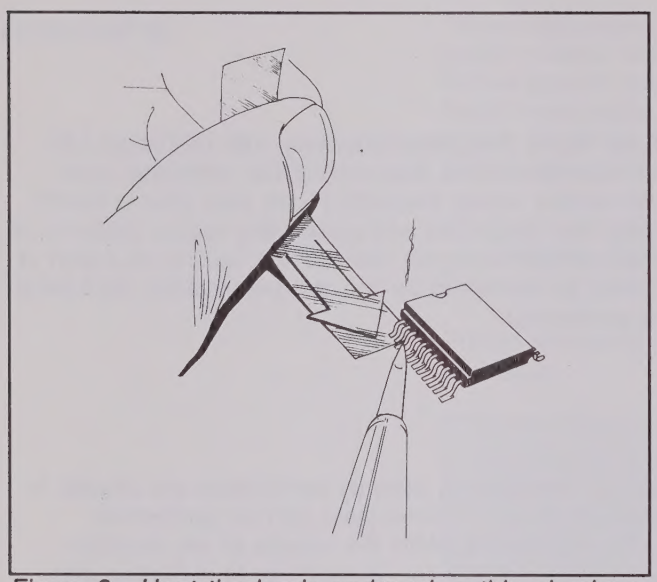

Figure 3. Heat the leads and push a thin aluminum sheet between the leads and the PC-board.

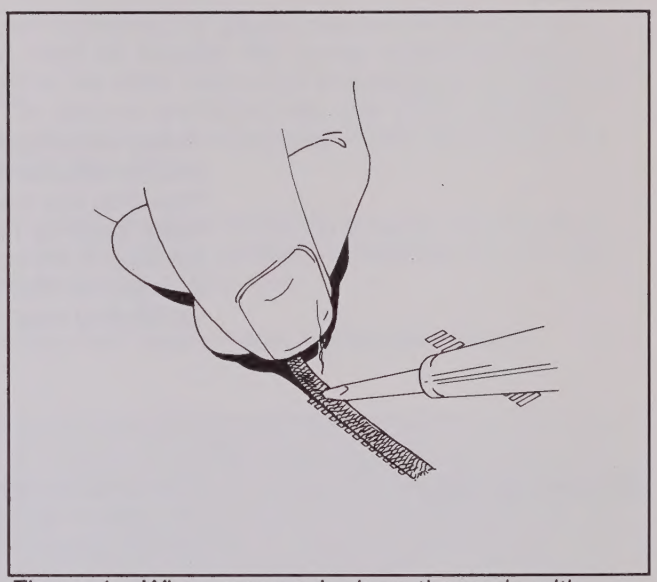

Figure 4. When removed, clean the pads with desoldering braid.

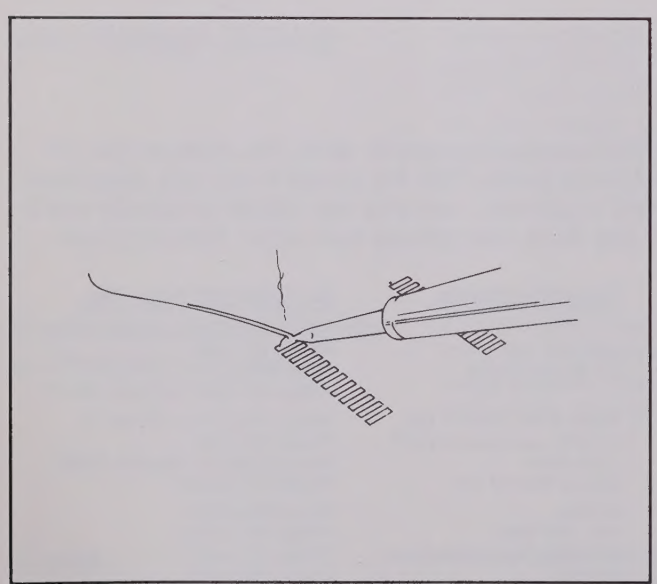

Figure 5. Place solder on one pad.

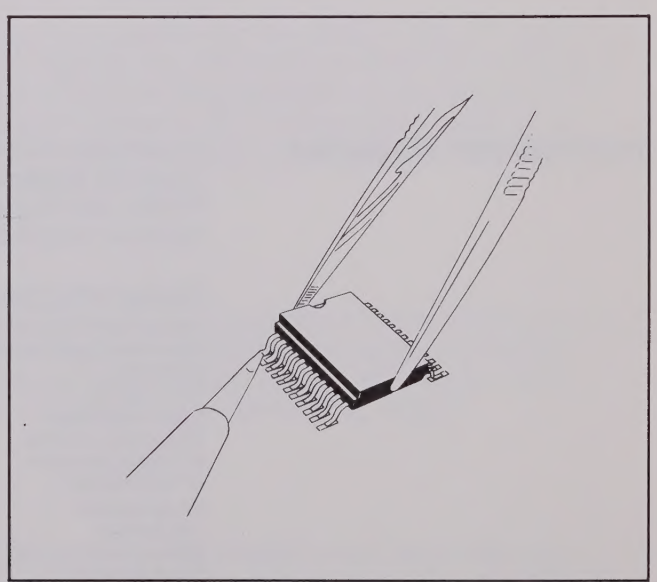

Figure 6. Attach the IC to the pad with solder.

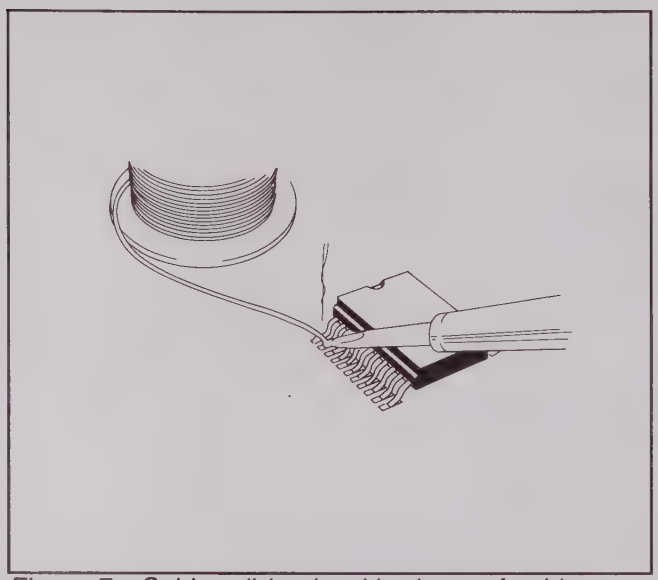

Figure 7. Solder all leads with plenty of solder; don't worry about short-circuits at this stage.

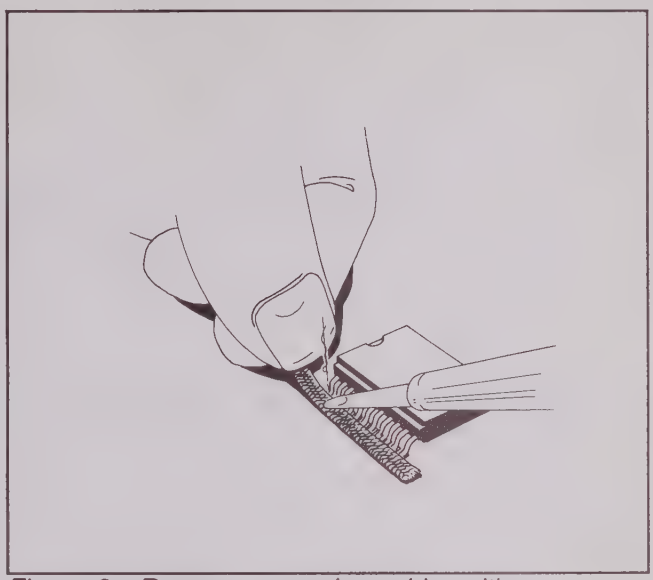

Figure 8. Remove excessive solder with desoldering braid.

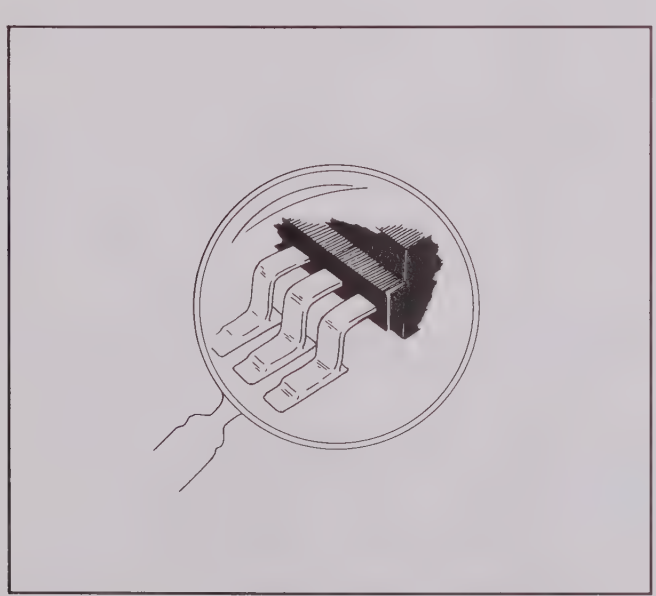

Figure 9. Use a strong magnifying glass to make sure there are no short-circuits or unsoldered leads.

DISMANTLING

Before describing the dismantling, a few words about designations of exterior parts and about options.

The designations in figure 10 are used in all descriptions throughout this manual.

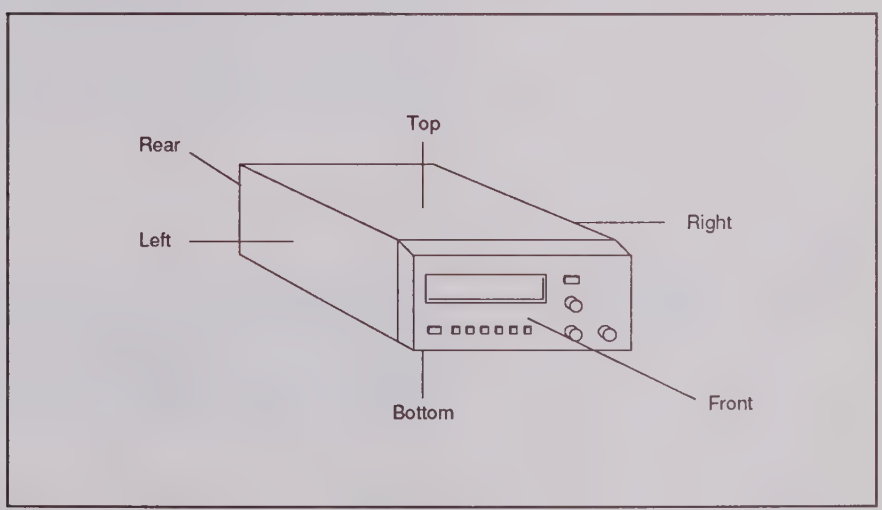

Figure 10. Exterior parts and directions.

The PM 6662 and PM 6669 are available with a number of options and accessories. Which of these are included can be identified by the labels on the rear panel. If no labels are fitted, the counter contains an *uncompensated crystal oscillator* and no options. The following labels exist:

PM 9604 GPIB Interface (PM 6669)
PM 9605 Battery Unit
PM 9607 MTCXO Oscillator (time-base)
PM 9608 1.1 GHz HF Input
PM 9608B 1.3 GHz HF Input
PM 9615 1.0 GHz HF Input

The GPIB Interface and Battery unit cannot be fitted in one and the same instrument. On newer instruments, the strip in the upper edge of the front panel also indicates which inputs are fitted to the instrument, e. g. 120 MHz/1.3 GHz means that a PM 9608B is fitted.

The location of these optional parts is illustrated by figure 11 on the next page.

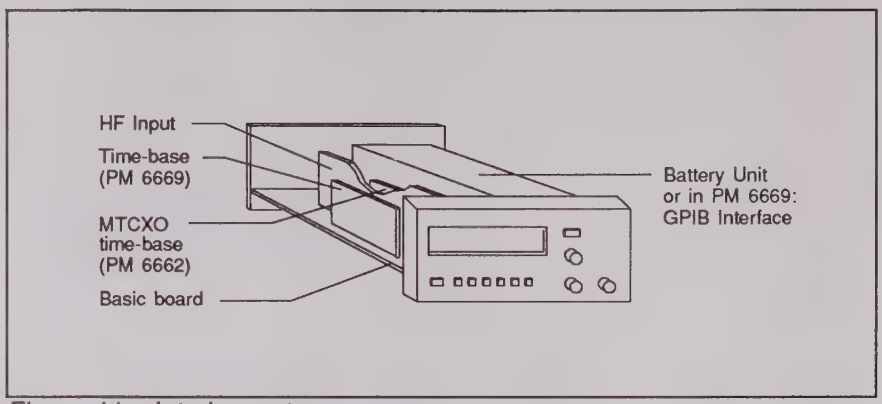

Figure 11. Interior parts.

WARNING: When you remove the cover you will expose live parts and accessible terminals which can cause death.

Removing the Cover

WARNING: Although the power switch is in the off position, the line voltage is present on the printed circuit board.

1) Make sure the power cable is disconnected.
2) Loosen the two screws in the rear feet (see figure 12).
3) Grip around the front panel and gently pull the counter out of the cover.

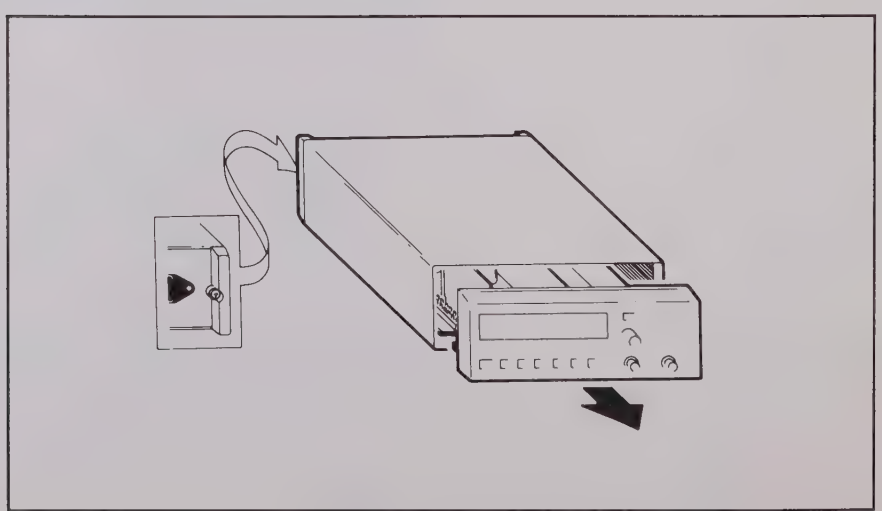

Figure 12. Loosen two screws to remove cover.

Fitting the Cover

The RFI shielding depends on proper grounding of the cover via the two screws in the rear feet. Always tighten these screws firmly.

HF Input

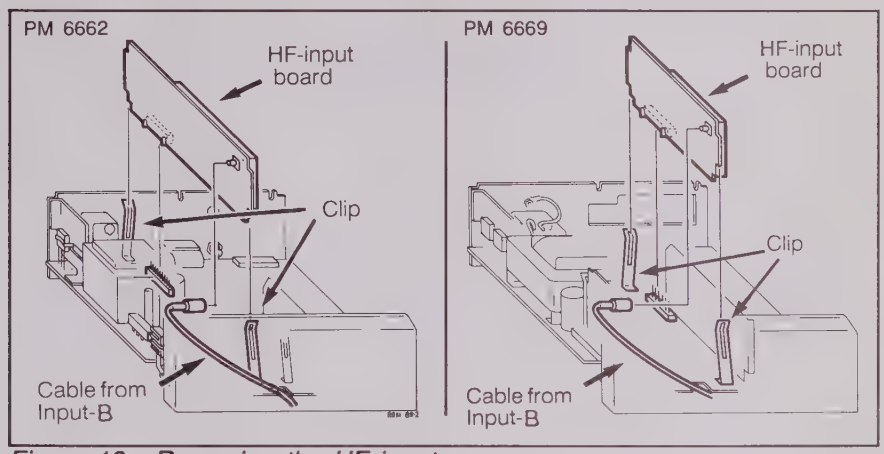

Figure 13. Removing the HF input.

The HF input is located behind the display (the longest of the two board spaces).

1) Remove the cover of the counter.
2) Disconnect the cable from the mini-coax connector on the HF input.
3) Prize the clips apart so they disengage from the tongues of the HF input printed-circuit-board and lift the board straight up.
4) When fitting the HF input, make sure that the connector pins fit exactly in the holes in the connector housing.

Time-Base Oscillator

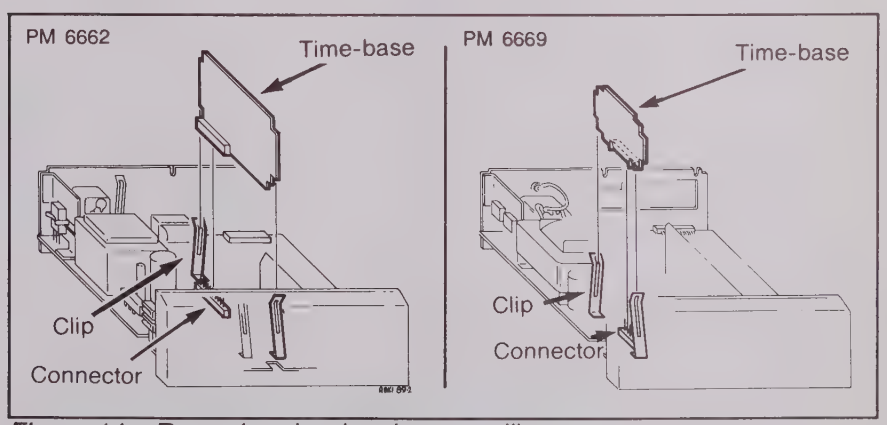

Figure 14. Removing the time-base oscillator.

The time-base oscillator (except for the uncompensated oscillator in the PM 6662 which is integrated in the basic board) is located behind the display (the shortest of the two board spaces).

1) Remove the cover of the counter.
2) Prize the clips apart and lift out the oscillator.
3) When fitting the oscillator, ensure that the connector pins fit exactly in the holes in the connector housing.

GPIB Interface
(PM 6669)

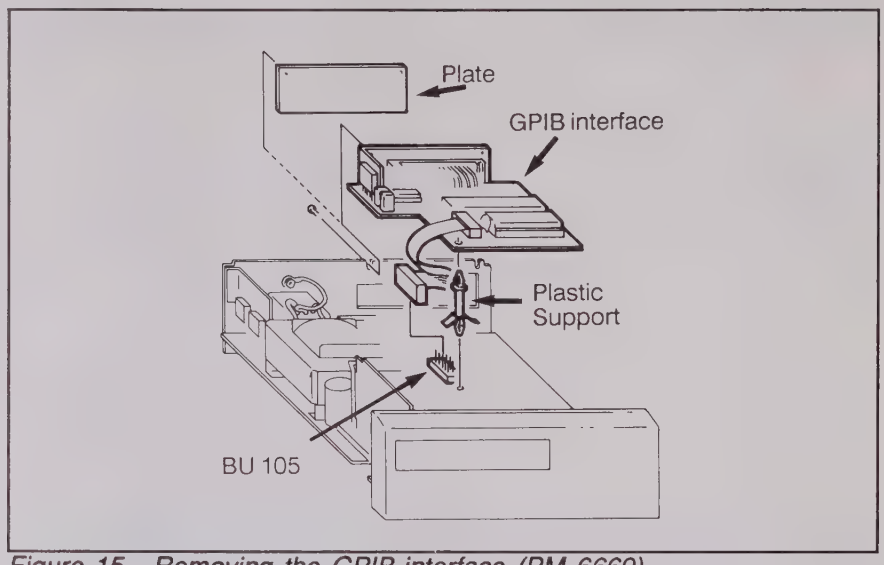

Figure 15. Removing the GPIB-interface (PM 6669).

1) Remove the cover.
2) Loosen the two screws holding the GPIB interface to the rear panel.
3) Disengage the interface from the plastic support next to BU105 on the basic board.
4) Disconnect the GPIB interface cable from BU105.

Battery Unit

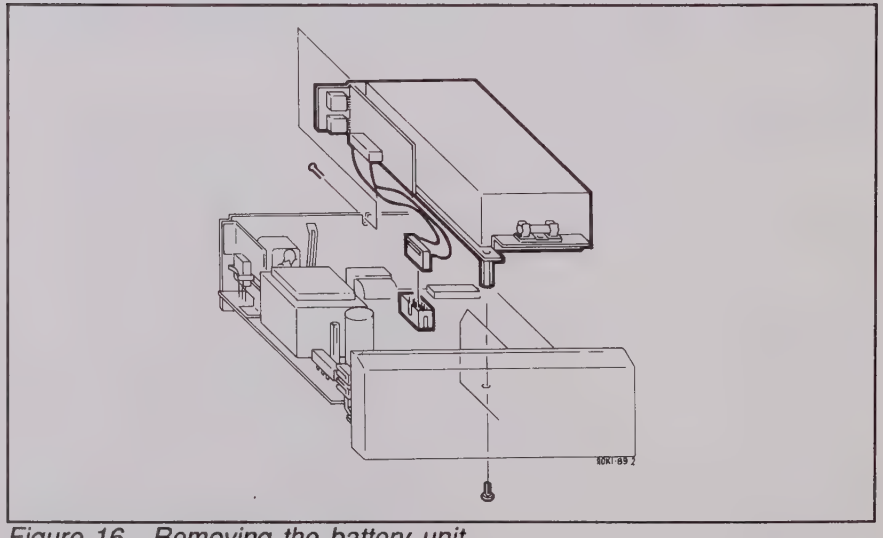

Figure 16. Removing the battery unit.

1) Remove the cover.
2) Loosen the two screws holding the battery unit to the rear panel.
3) Loosen the screw holding the battery unit to the basic PC-board.
4) Disconnect the battery unit cable from BU105 on the basic board.

NOTE.
Do not touch the front panel with the fuse of the battery unit.

FUNCTIONAL DESCRIPTION

This chapter is divided into two parts. The first part, *"Block Diagram Description"*, comprises block diagram for the entire counter and a basic board layout. The second part, *"Circuit Descriptions"*, comprises detailed descriptions for the blocks.

Block Diagram Description

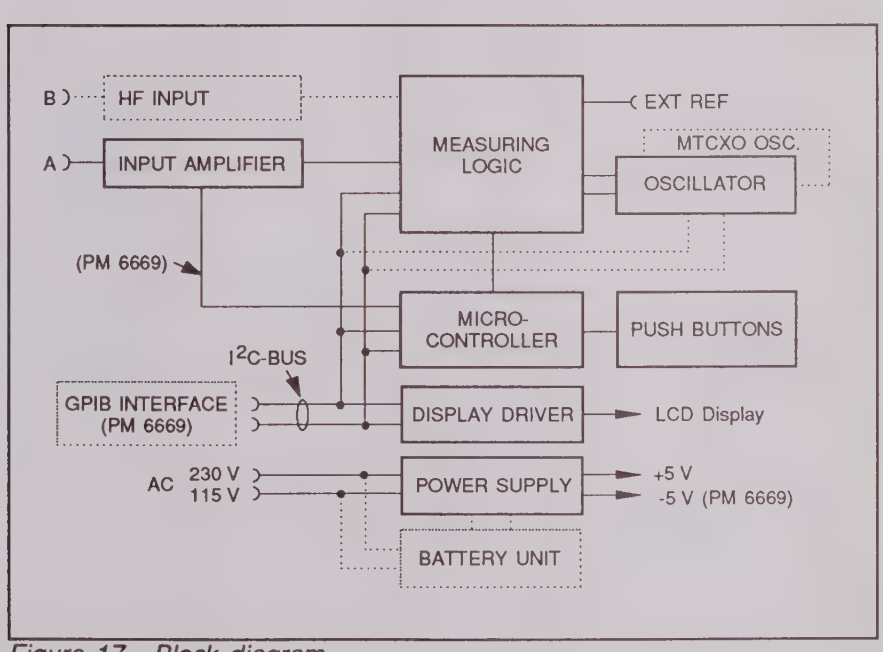

Figure 17. Block diagram.

The counter contains the following functions (locations, see next page):

- **INPUT AMPLIFIER**, shape the input signal to well defined pulses.
- **MEASURING LOGIC**, one-chip counter containing the synchronization circuitry, main gates and counting registers.
- **MICRO-CONTROLLER**, controls the data flow inside the counter.
- **I²C-BUS**, internal address- and data-bus for communication between micro-controller, measuring logic, and options.
- **OSCILLATOR**, generates a stable 10 MHz clock signal.
- **PUSH BUTTONS**, form the man-machine control interface.
- **DISPLAY DRIVER**, feeds information to the LCD display.
- **POWER SUPPLY**, generates supply voltages of +5 V and for PM 6669 also -5 V.

The following functions are available as options:

- **HF INPUT**, permits measurement of high frequency signals.
- **MTCXO OSCILLATOR**, gives a temperature-compensated time-base for higher accuracy.
- **GPIB INTERFACE** (PM 6669), permits communication with the counter from an external GPIB bus.
- **BATTERY UNIT**, makes the counter temporarily independent of the power line.

• *Basic Board Layout*

The basic board layouts, including outlines of the functional blocks, are illustrated by figure 18 (PM 6662) and figure 19 (PM 6669).

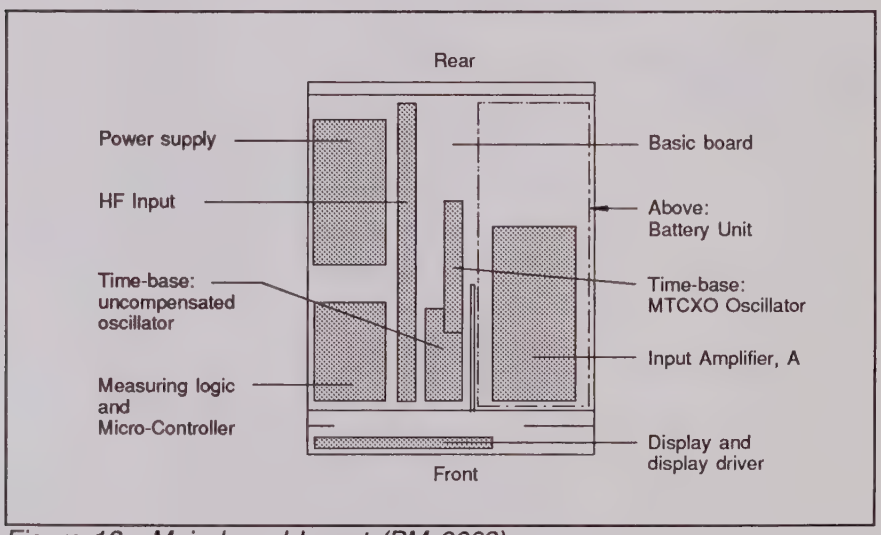

Figure 18. Main board layout (PM 6662).

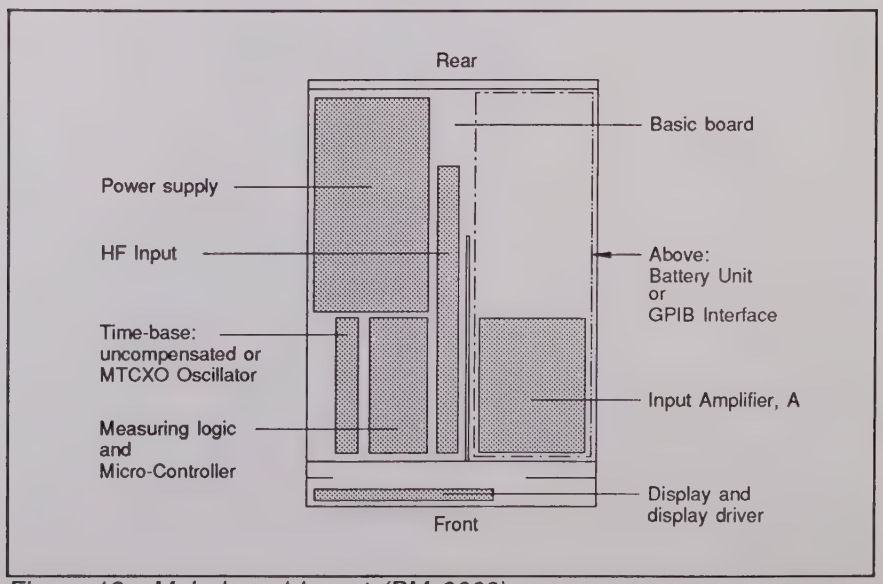

Figure 19. Main board layout (PM 6669).

Circuit Description

Conventions

Components which are not important for the function are omitted from the figures in this chapter. Furthermore, where more than one component is connected in series or parallel, only one component is mentioned. For the complete set of components see the circuit diagrams in chapter: "Drawings and Diagrams".

- ***Input Amplifier***

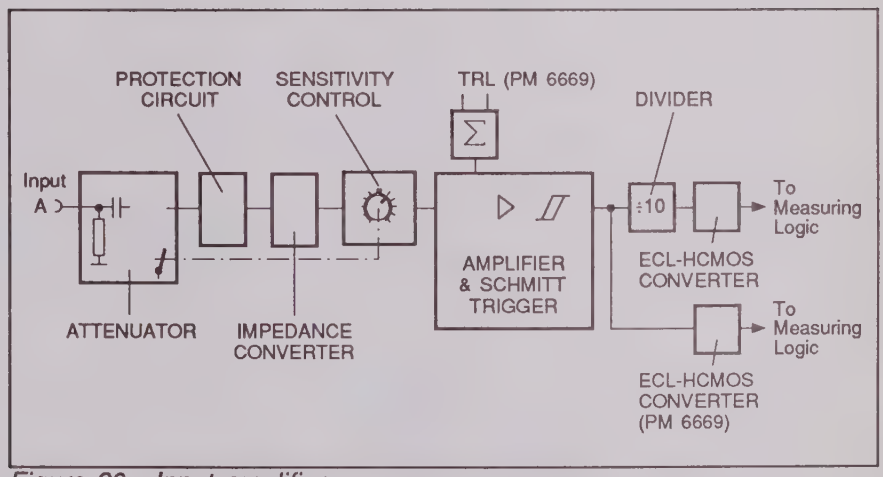

Figure 20. Input amplifier.

The input amplifier A is AC coupled and measures signals at frequencies up to 120 MHz.

The input amplifier contains the sub-functions shown in figure 20 above. These are individually described on the following pages:

- ATTENUATOR . . . . . page 18
- PROTECTION CIRCUIT 19
- IMPEDANCE CONVERTER 20
- SENSITIVITY CONTROL 21
- AMPLIFIER & SCHMITT TRIGGER (PM 6662) 22
- AMPLIFIER & SCHMITT TRIGGER (PM 6669) 24
- DIVIDER 25
- ECL-HCMOS CONVERTER 25

Attenuator

After the AC capacitor (C101) the signal is fed to the attenuator circuitry which allows the level to be matched to the Schmitt trigger and to the dynamic range of the impedance converter.

The attenuator is different in the PM 6662 and PM 6669.

PM 6662:

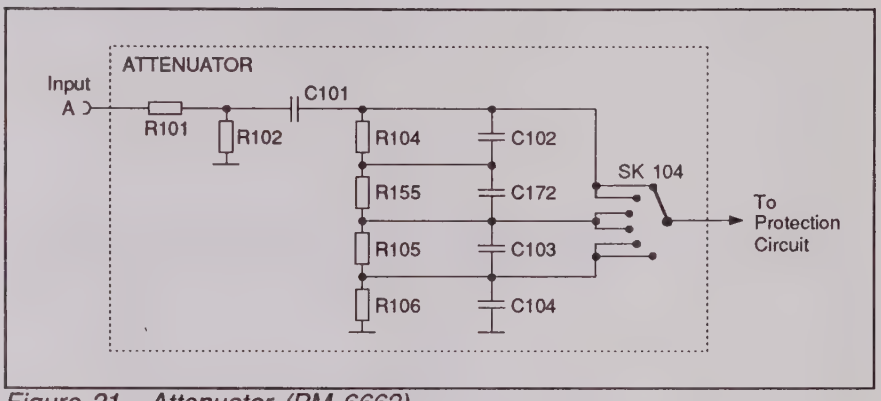

Figure 21. Attenuator (PM 6662).

R102 is the discharging resistor for the AC capacitor C101.

The attenuator, which also sets the input impedance, consists of one resistor chain (R104-R155-R105-R106) and one capacitor chain (C102-C172-C103-C104) connected in parallel. The attenuation is selected by the "Sensitive" switch, SK104, which is a part of the "Sensitive Control", described on page 21.

Attenuation: 0 times for the settings 5 V_{rms} and 1.5 V_{rms}
10 times for the settings 0.5 V_{rms} and 150 mV_{rms}
100 times for the settings 0.5 mV_{rms} and 15 mV_{rms}

PM 6669:

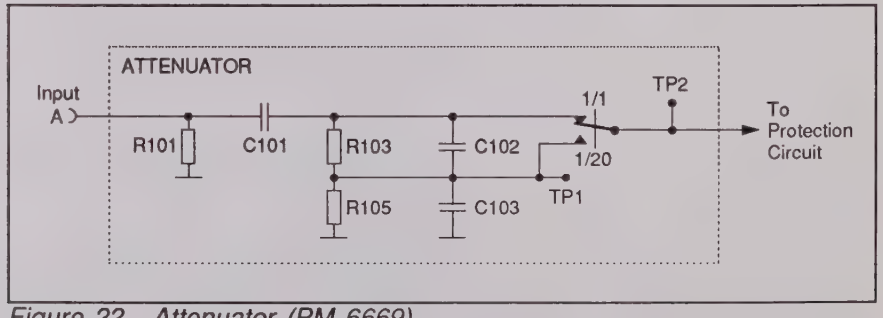

Figure 22. Attenuator (PM 6669).

R101 is the discharging resistor for the AC capacitor C101.

A fixed voltage divider is formed by R103, R105, C102, and C103. The "Sensitivity" switch selects between 0 times attenuation (1/1), or 20 times (1/20). Measuring points: TP1 (1/20), TP2 (output).

1/1 Measuring range - 10 mV.

1/20 Measuring range - 200 mV.

Protection Circuit

The protection circuits are different in the two types, but they both protect the impedance converters from excessive input amplitudes.

PM 6662:

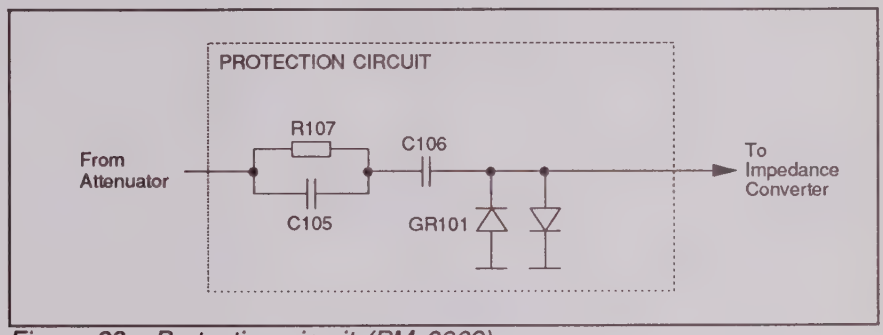

Figure 23. Protection circuit (PM 6662).

The signal is limited by the resistors R107 and R101 (see figure 21). The two diodes GR101 limits the signal amplitude to about ±0.6 V.

PM 6669:

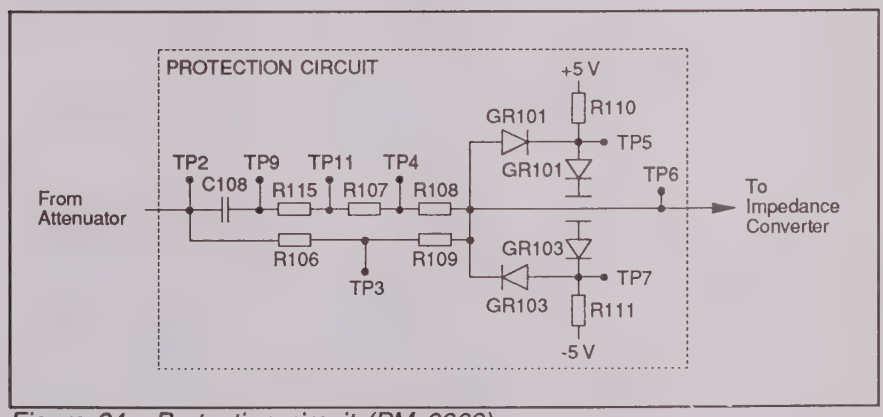

Figure 24. Protection circuit (PM 6669).

LF signals are fed via the protection resistors R106 and R109. Measuring point: TP3.

HF signals are fed via the protective component chain C108-R115-R107-R108. Measuring points: TP9, TP11, and TP4.

The diodes GR101 and GR103 limits the signal to about ±5 V. Measuring points: TP5 and TP7.

Input measuring point (from the attenuator): TP2.
Output measuring point (to the impedance converter): TP6.

Impedance Converter

The impedance converters are different in the two types, but they have in common to convert to a low-impedance signal for the following amplifier and Schmitt trigger.

PM 6662:

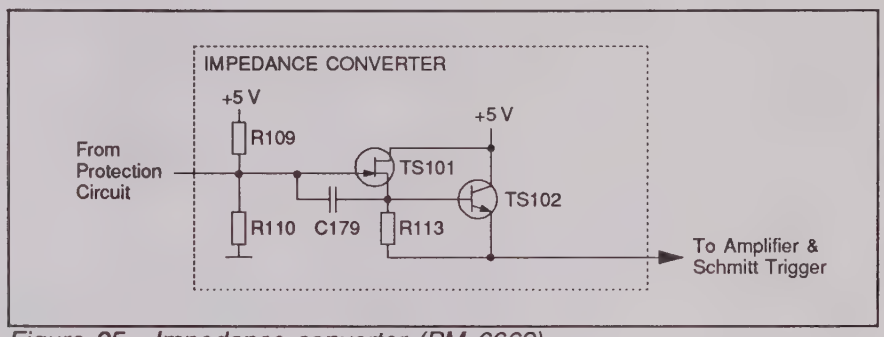

Figure 25. Impedance converter (PM 6662).

The active components in the converter are the transistors TS101 and TS102.

R109 and R110 sets the DC level for TS101 to obtain a dynamic range which is stable and symmetrical around the working point.

C179 corrects the frequency band by letting the high frequencies bypass TS101.

PM 6669:

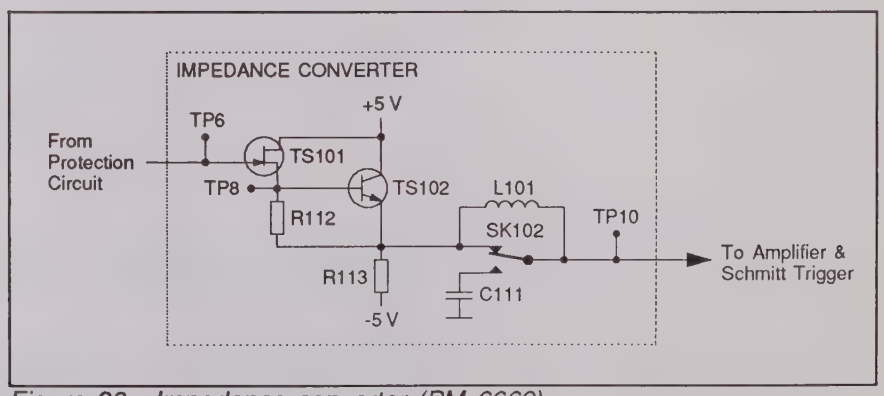

Figure 26. Impedance converter (PM 6669).

The active components in the converter are the transistors TS101 and TS102. Measuring points for these are TP6 and TP8.

L101 and C111 form an LP filter when connected in the signal path by the push button "FILTER < 50 kHz" (SK102).

This LP filter starts suppressing noise at 50 kHz.

Measuring point after the LP filter: TP10.

Sensitivity Control

The sensitivity control is different in the PM 6662 and PM 6669.

PM 6662:

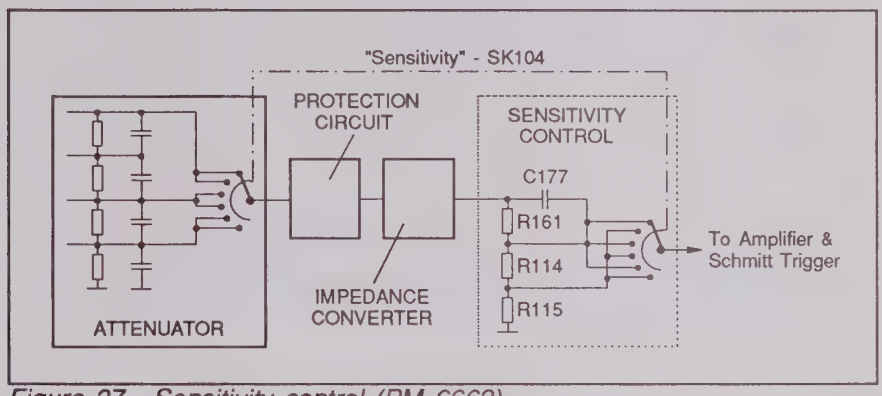

Figure 27. Sensitivity control (PM 6662).

The sensitivity control is handled by the ganged switch SK104. This is connected to the voltage divider in the attenuator, but works also as an own voltage divider of the signal from the impedance converter.

The attenuation ratio in the first stage (attenuator) is 1:10:100, and in the second stage (sensitivity control) 1:3.

This gives the sensitivity states:

5 V_{rms} - 1.5 V_{rms} - 0.5 V_{rms} - 150 mV_{rms} - 0.5 mV_{rms} - 15 mV_{rms}

R114 and R115 form the voltage divider for the attenuation ratio 1:0.3.

R161 compensates for the gain in the following amplifier (IC101).

C177 compensates for a bad frequency response in the impedance converter (TS101).

PM 6669:

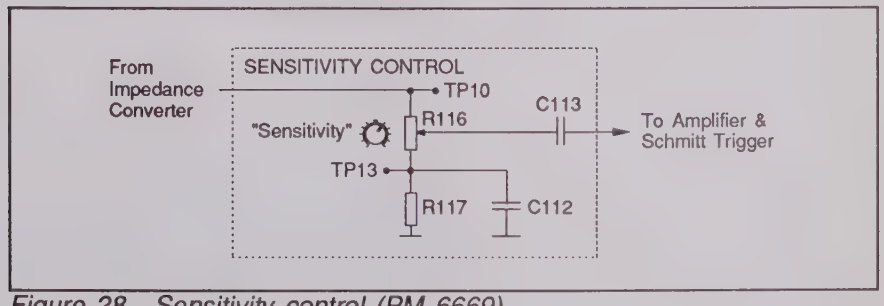

Figure 28. Sensitivity control (PM 6669).

The adjustment of the amplitude to the amplifier/Schmitt trigger is handled by potentiometer R116 (and resistor R117). Measuring points: TP10 and TP13.

C112 reduces the high frequency crosstalk.

The switch in the potentiometer selects the sensitivity range (1/1 or 1/20), see the section on *"Attenuator"*, page 18.

Amplifier & Schmitt Trigger (PM 6662)

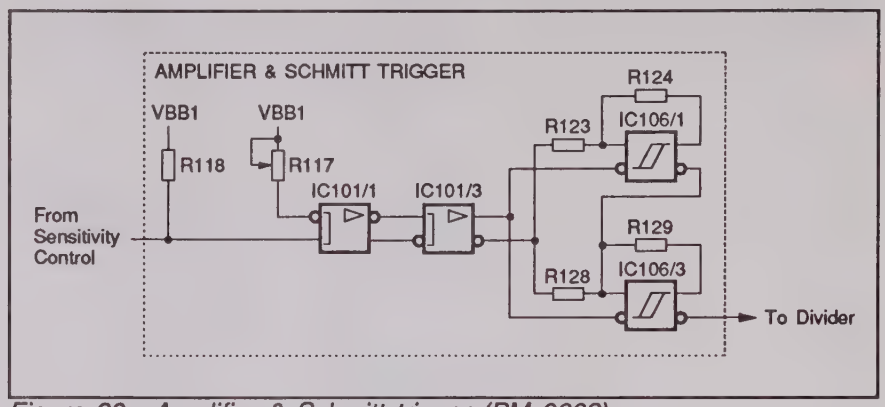

Figure 29. Amplifier & Schmitt trigger (PM 6662).

Amplifier

IC101 is a line receiver which is used as a wideband amplifier.

The signal amplitude fed to this amplifier can vary from a few mV_{p-p} to about 1 V_{p-p} depending on the sensitivity control setting and the input amplitude.

Potentiometer R117 (BAL) is used to adjust the output signal to a symmetrical shape.

The output signal from the amplifier has an amplitude of about 1 V_{p-p}.

Schmitt trigger with automatic trigger level compensation

After the amplifier stage there are two Schmitt trigger circuits, IC106/1 (called "A" in the following text) and IC106/3 (called "B" in the text).

The following text refers to figure 30.

"A" has a hysteresis band without any offset and thus positioned symmetrical around zero. See the signal diagram.

"B" has a hysteresis band which can be switched either to a HIGH or to a LOW offset band.

The output state of the "A" trigger controls the switching between HIGH and LOW offset band for the "B" trigger.

Positive pulse train

In the signal diagram the "B" trigger has a LOW offset from the start point.

The output of the "A" trigger goes high when the signal exceeds the upper hysteresis border. This high output from the "A" trigger switches the "B" offset to the HIGH position.

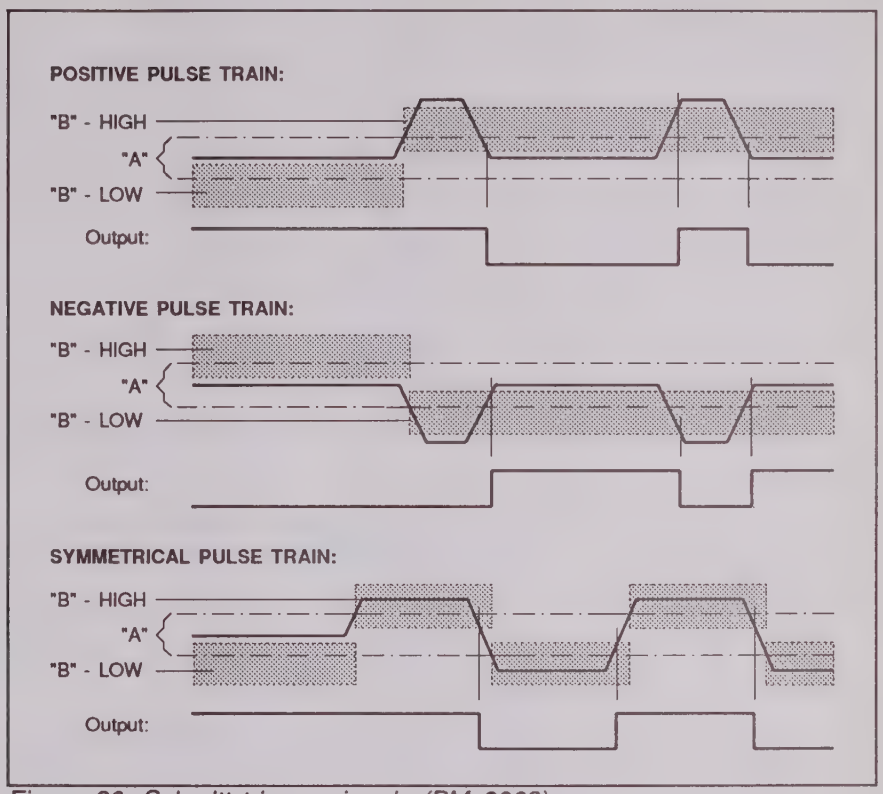

Figure 30. Schmitt trigger signals (PM 6662)

The subsequent pulses trigger the output signal every time the signal exits the "B" trigger hysteresis band.

The first pulse in the pulse train is thus used to correct the "B" trigger offset state, if this is in the wrong position at start.

Negative pulse train

The triggering sequence is the same but inverted for a negative pulse train.

Symmetrical pulse train

At symmetrical input wave form the "B" trigger switches the offset position between HIGH and LOW every time the signal exits the "A" trigger hysteresis band.

The output signal is triggered every time the signal exits the "B" trigger hysteresis band.

The first pulse in the pulse train can even here be used to correct the "B" trigger offset state.

Amplifier & Schmitt Trigger (PM 6669)

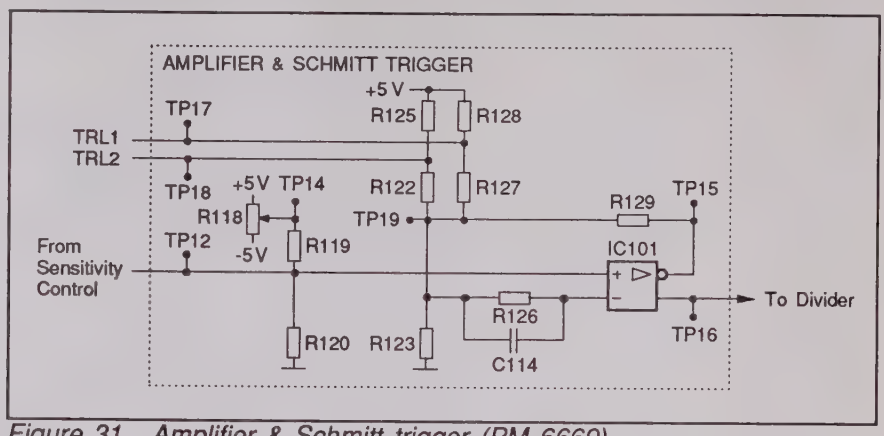

Figure 31. Amplifier & Schmitt trigger (PM 6669).

IC101 is a wide band amplifier which is connected as a Schmitt trigger. Measuring points: TP12 input signal, TP16 output signal.

R119 and R120 set the offset voltage to the input of the amplifier circuit IC101. This voltage is to be adjusted to the minimum value by potentiometer R118. Measuring points: TP12 and TP14.

The hysteresis band width for the trigger function is set by the resistors R123 and R129. Measuring points: TP15 and TP19.

To be able to measure signals with very high or very low duty factor correctly, the position of the trigger level hysteresis band is matched by the Micro-Controller as follows (figure 32 shows pulse diagrams for the trigger level function):

When the trigger function is set either for a positive pulse train (display symbol: ⎍⎍) or for a negative pulse train (display symbol: ⏉⏉) the Micro-Controller raises or lowers the position of the hysteresis band by applying 0 V or +5 V to TRL1 and TRL2.

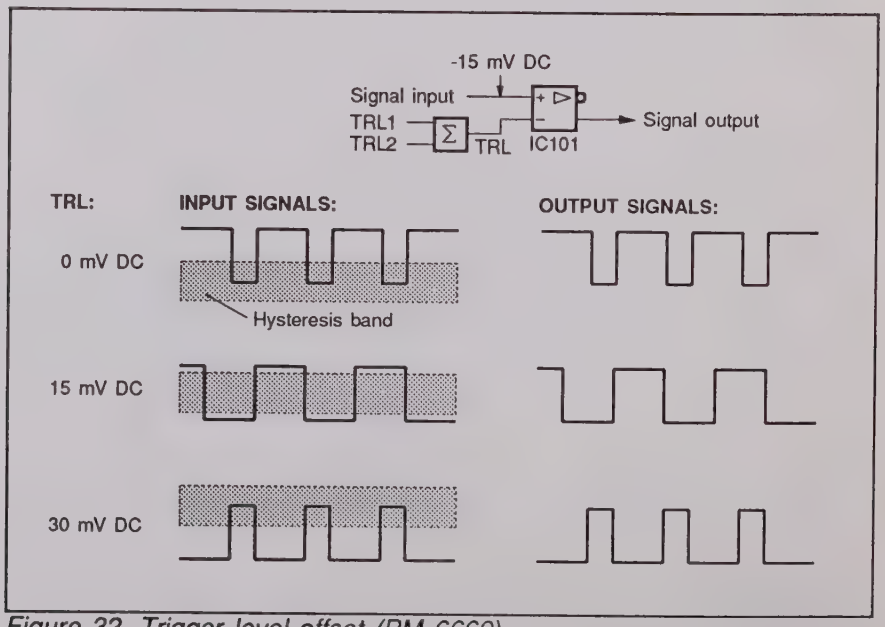

Figure 32. Trigger level offset (PM 6669)

When the trigger function is set to AUTO, the Micro-Controller first tries the hysteresis band without any offset (around zero). If the measuring logic has not received a correct pulse train within a certain time, the Micro-Controller raises the hysteresis band. If no correct pulse train is received now, the Micro-Controller lowers the band.

TRL1 (measuring point TP17) is connected to the amplifier circuit IC101 via the voltage divider R128, R127, and R123. The voltage variations in TRL1, generated by the Micro-Controller, affects thus the trigger level for the IC101 (measuring point TP19).

TRL2 (measuring point TP18) affects the trigger level in the same manner, but via R125, R122, and R123.

The voltage dividers, affected by TRL1 and TRL2, are shown as a sum-box in figure 32.

The offset values from this sum-box is fed as the trigger level reference (TRL) to the amplifier circuit IC101.

Divider and ECL-HCMOS Converter (PM 6662)

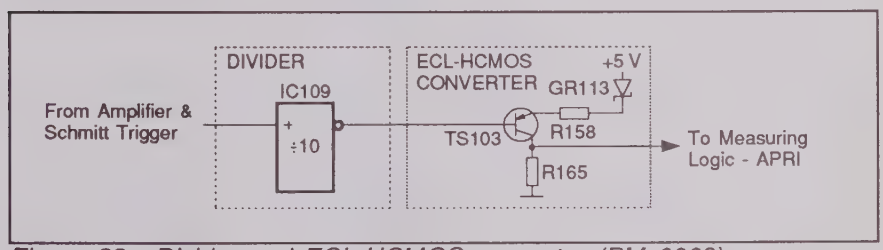

Figure 33. Divider and ECL-HCMOS converter (PM 6662).

The signal from the Amplifier & Schmitt Trigger is divided by 10 in the Divider before ECL to HCMOS conversion. The division is performed by the circuit IC109.

The signal is then converted from ECL to HCMOS by transistor TS103.

Divider and ECL-HCMOS Converter (PM 6669)

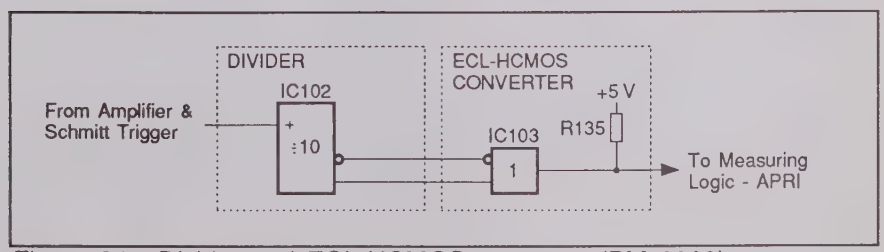

Figure 34. Divider and ECL-HCMOS converter (PM 6669).

In some measuring modes, the input signal must be divided by 10 in the Divider before ECL to HCMOS conversion. This division is performed by the circuit IC102.

The signal from either the Amplifier & Schmitt Trigger or from the Divider is converted by the ECL-to-TTL converter IC103. HCMOS-level is obtained by adding +5 V to the TTL level via resistor R135.

• Measuring Logic

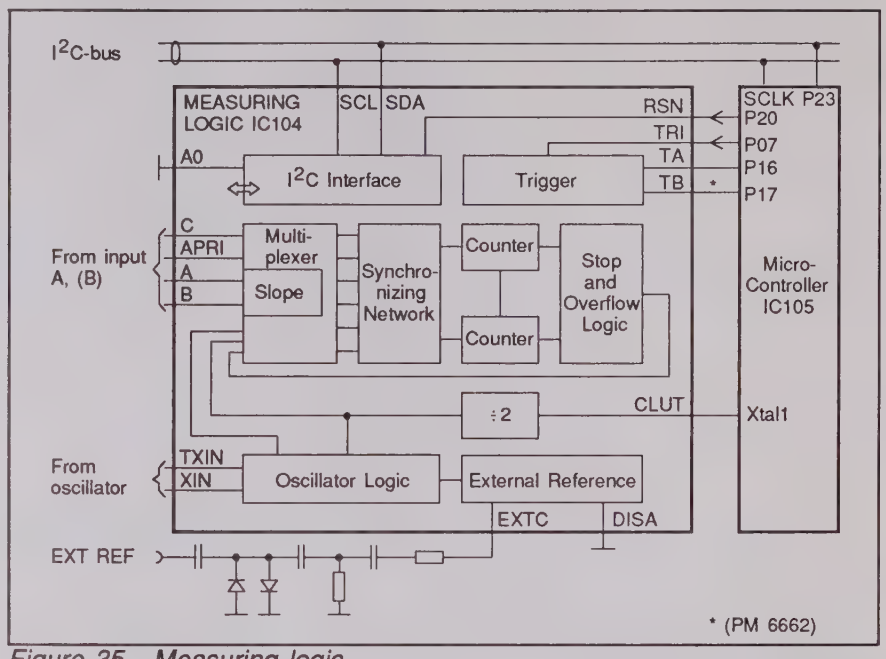

Figure 35. Measuring logic.

The Measuring Logic, which handles the actual measuring, is housed in a custom designed integrated circuit IC104.

Depending on the desired measuring input, the multiplexer selects the following inputs (APRI comes from the divider circuit);

PM 6662: APRI (measuring input A) or C (HF input B).
PM 6669: A, APRI (measuring input A) or C (HF input B.

The multiplexer receives the clock signal XIN via the Oscillator Logic. If the counter is equipped with an MTCXO oscillator, the signal TXIN is used for the input signal from the temperature oscillator.

If an external reference (EXT REF) is used, the clock signal is received via EXTC, then amplified and converted to HCMOS level in the External Reference circuit. The clock signal is divided by two and is then fed to the Micro-Controller as CLUT.

The Synchronizing Network receives the selected input signal and the clock signal. The circuit synchronizes the clock signal to measuring start and measuring stop. This function prevents from the counting of incomplete input pulses at the start and stop of the measurement.

The input signal and the clock signal are counted in separate counter registers. Some measuring modes only count one of the signals and then utilize the two registers connected in series.

The Stop and Overflow Logic tries to stop the measurement if the counter registers overflow. If it does not succeed, the counter indicates "Error OF".

The Measuring Logic and the Micro-Controller communicates via the I²C-bus.

A program flowchart, illustrating the program flow during a measuring cycle, is presented after the section on *"Micro-Controller and I²C-bus"*.

• Micro-Controller and I²C-Bus

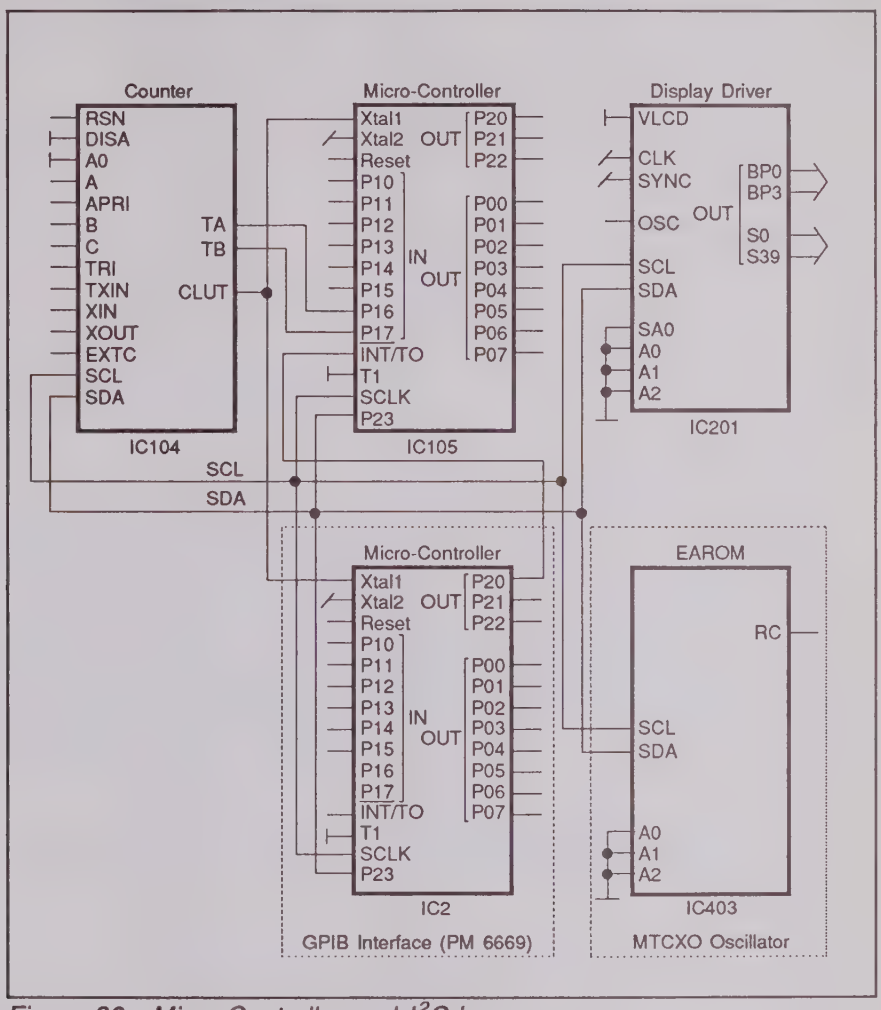

Figure 36. Micro-Controller and I²C-bus.

Micro-Controller

The Micro-Controller is a single chip microcomputer, IC105, with an internal 128 byte RAM and 6 kbyte ROM. It has 19 I/O-ports.

The Micro-Controller communicates with the other counter circuits via the I²C-bus. When information is to be sent on the bus the Micro-Controller outputs a 100 kHz clock signal on the clock line SCL. Before transmitting or receiving data it also sends the unique 1-byte-address of the receiving circuit on the data line SDA.

I²C-bus

The I²C-bus is a 2-line serial bus for the communication between the ICs. The Micro-Controller, IC105, controls the communication with the clock-line SCL. One or more slaves can read or write on the data-line SDA.

The SDA and SCL are high at stand by. All ICs connected to the bus can sink SDA to low as they are connected via open collector outputs.

The Micro-Controller starts and stops the communication by sending terms of start and stop:

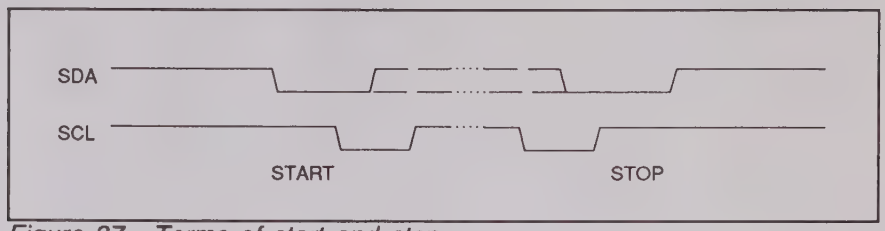

Figure 37. Terms of start and stop.

During transmission the SDA can be changed only when the SCL is low.

The Micro-Controller always begins to send the address information. The format of this address information is 7 address bits, one read/write bit, and one acknowledge bit.

Addressed slave accepts by keeping the SDA line low while the acknowledge bit (ACKN in figure 38) is sent by the Micro-Controller.

Example of addressing (address 30H):

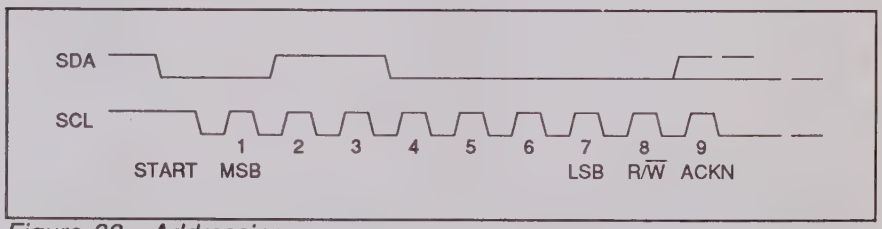

Figure 38. Addressing.

The read/write bit R/$\overline{W}$ has the following meaning:

R/$\overline{W}$ = 1 means information from the slave to the Micro-Controller.
R/$\overline{W}$ = 0 means information from the Micro-Controller to the slave.

The data information is sent after the address information. The format of the data information is 8 data bits followed by one acknowledge bit. The receiver accepts by keeping the SDA line low while the acknowledge bit (ACKN in figure 39) is sent.

Example of data transmission (data 9BH):

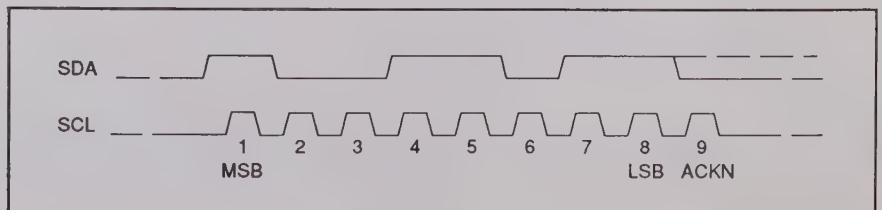

Figure 39. Data transmission.

Measuring Cycle

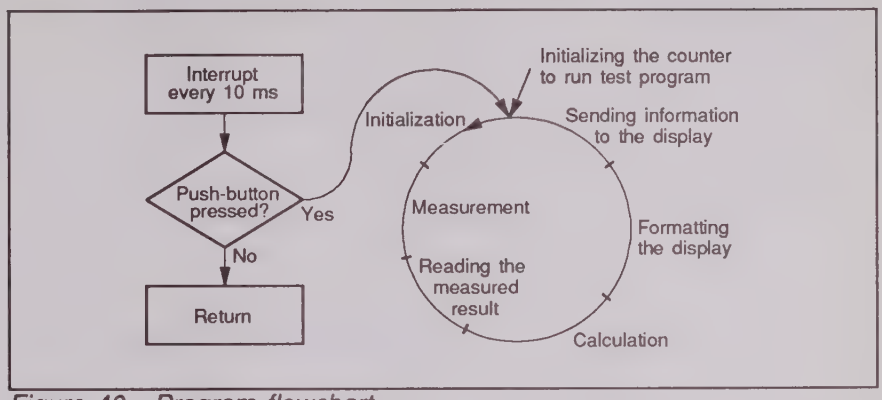

Figure 40. Program flowchart.

After power-up the Micro-Controller initializes the counter by running test programs and checking the version of the counter.

The Micro-Controller then orders the measuring logic to reset all registers. New setup commands are sent by the Micro-Controller.

The Micro-Controller requests the measuring logic to start the measuring cycle, then waits for the start of the measurement. When this happens, the Micro-Controller calculates the measuring time, and when this time has elapsed it instructs the Measuring Logic to stop the measuring cycle.

After the measuring cycle is completed the Micro-Controller calculates the result and format. This information is sent to the display.

- ***Oscillator***
  (PM 6662)

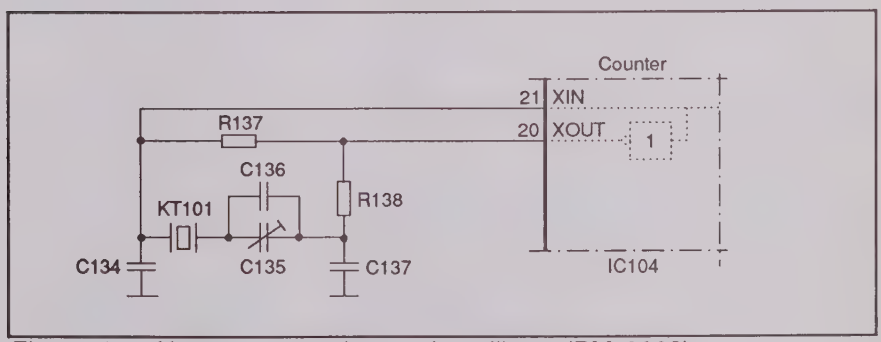

Figure 41. Uncompensated crystal oscillator (PM 6662).

The uncompensated crystal oscillator is a Pierce-type oscillator using an inverter from the counter circuit IC104 as the active element. The oscillator circuit is integrated in the basic board.

The inverter is connected to the oscillator circuitry via pin 21 XIN and 20 XOUT.

The frequency is adjusted with trimmer capacitor C135. The fixed capacitor C136 sets the adjusting range.

R137 sets the DC input level to the inverter in IC104.

R138 limits the power through the crystal to about 0.5 mW to get as good stability as possible.

- ***Oscillator***
  (PM 6669)

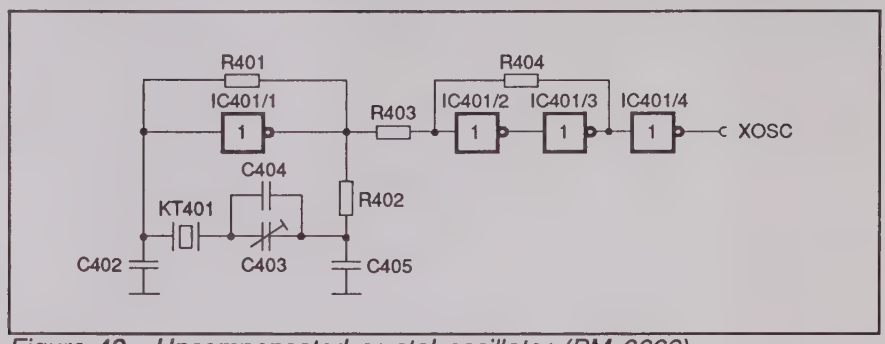

Figure 42. Uncompensated crystal oscillator (PM 6669).

The uncompensated crystal oscillator is a Pierce-type oscillator using an inverter, IC401/1, as the active element. The oscillator circuit is built on a separate board.

The frequency is adjusted with trimmer capacitor C403. The fixed capacitor C404 sets the adjusting range.

R401 sets the DC input level to IC401/1.

R402 limits the power through the crystal to about 0.5 mW to get as good stability as possible.

R403, R404 and IC401/2-3 form a Schmitt trigger to eliminate ringing.

IC401/4 drives the output.

- ***Push Buttons***

The push button function of the PM 6662 counter is illustrated in figure 43. Figure 44 shows the corresponding function of the PM 6669.

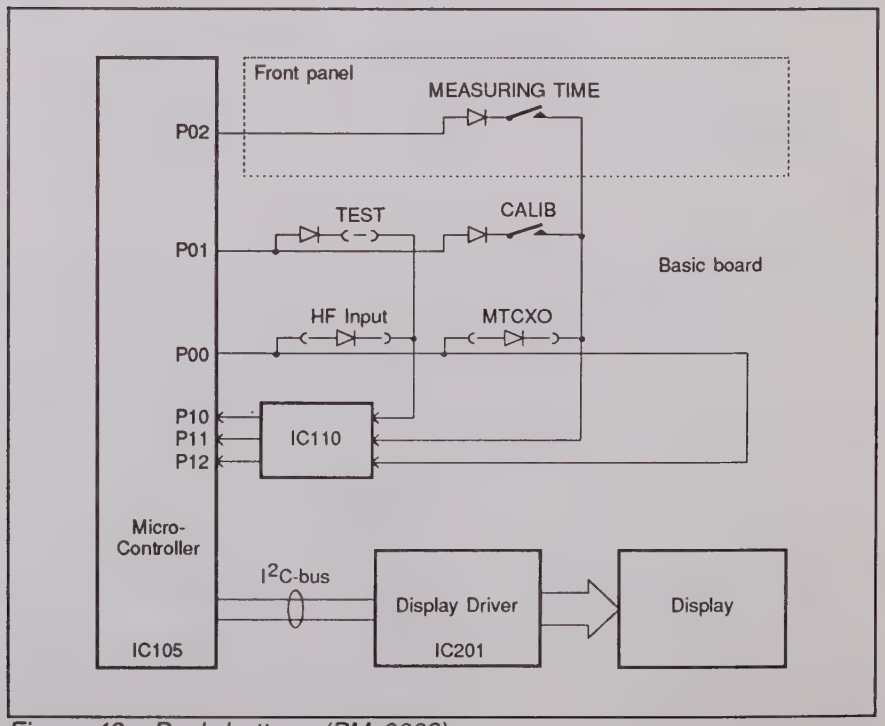

Figure 43. Push buttons (PM 6662).

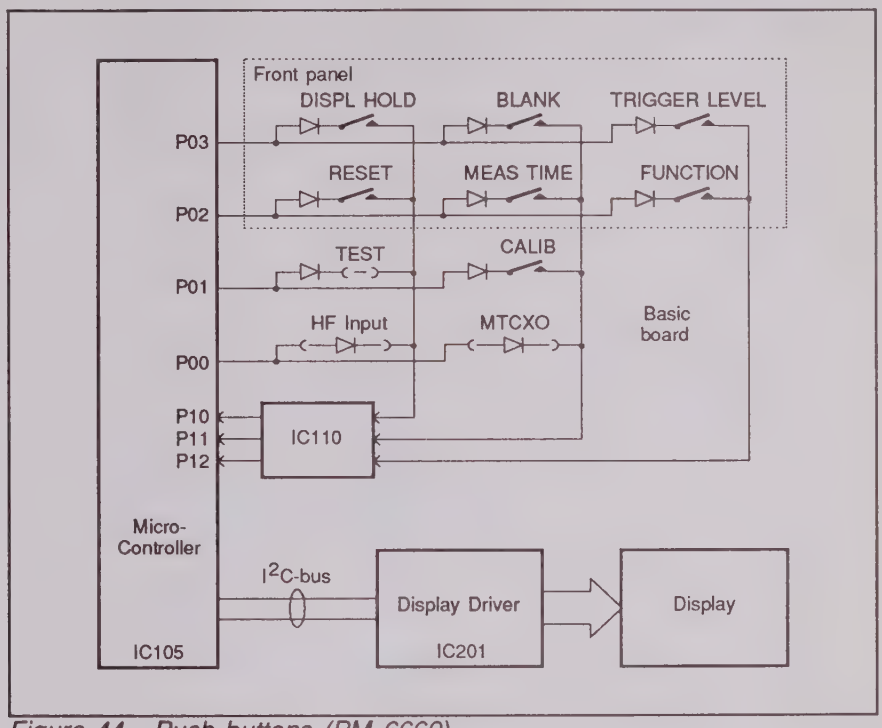

Figure 44. Push buttons (PM 6669).

Every 10 ms an interrupt is generated by the Micro-Controller. This interrupt starts a scanning of the push buttons to see if any button has been pressed. The scanning is controlled by the Micro-Controller and performed by reading the signals P10...P12 from the buttons while the signals P00...P02 (PM 6662) or P00...P03 (PM 6669) are set high - one at a time.

IC110 is used as an impedance converter.

This circuit also checks the identity of the counter and presence of any option diode indicating an MTCXO oscillator or a HF input.

The identity of the counter is detected with the aid of the connection between P00 and P12. This connection is an identity connection;

Existing identity connection detects as PM 6662.

No identity connection detects as PM 6669.

- ***Display Driver***

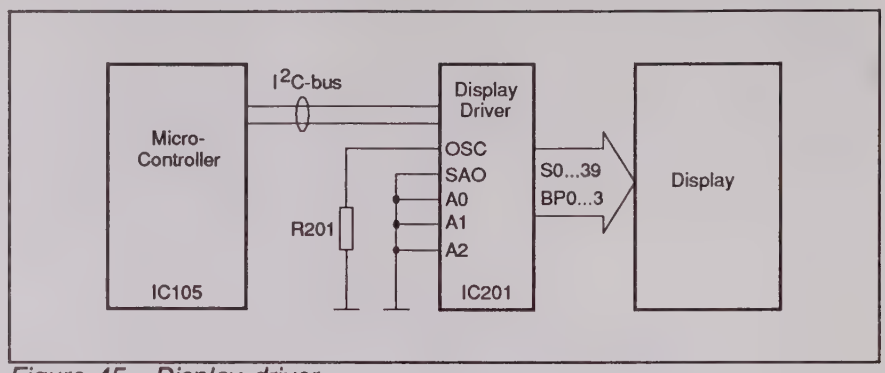

Figure 45. Display driver.

The Micro-Controller updates the display last in every measuring cycle by sending segment information via the I^2C-bus to the display driver IC201 (the display driver address is set by pins SAO, A0, A1 and A2).

The display driver converts the information to repetitive pulse trains before feeding the display (via S0...S39 and BP0...BP3).

The display is multiplexed by a factor of 1:3 to keep the number of input pins low.

R201 sets the frequency of the internal display driver oscillator.

• *Power Supply*

The PM 6662 and PM 6669 can be run from 115 or 230 V AC (±15%) mains supply, 46 - 440 Hz, or from built-in battery units.

Figure 46 and 47 shows the power supply units, which are not similar for the both counters.

PM 6662:

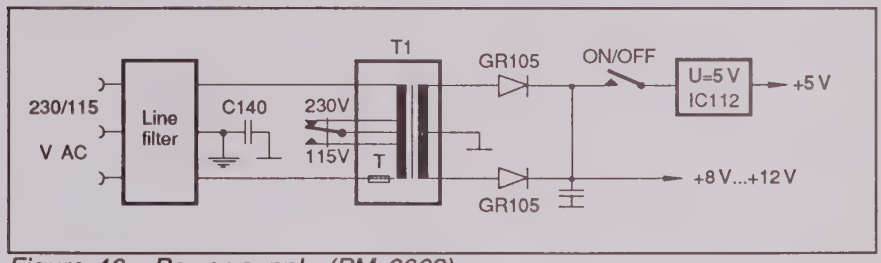

Figure 46. Power supply (PM 6662).

The PM 6662 power supply unit generates regulated +5 V for the logic, and unregulated +8 V...+12 V for the battery unit.

From the line filter the mains supply is fed to the mains selector and transformer T1 which contains a built-in thermal fuse (T).

Capacitor C140 is connected between chassis and signal ground to improve signal ground to the rear panel input (EXT REF).

PM 6669:

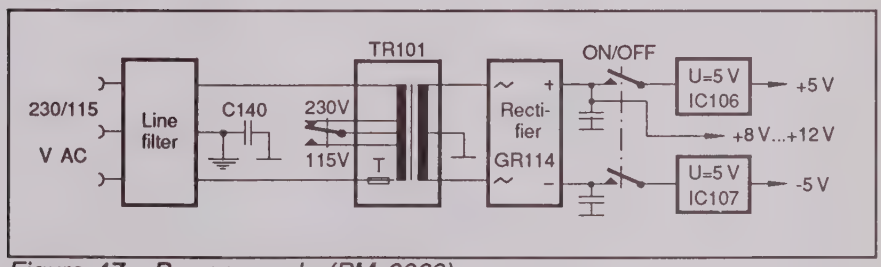

Figure 47. Power supply (PM 6669).

The PM 6669 power supply unit generates regulated +5 V and -5 V for the logic, and unregulated +8 V...+12 V for the battery unit or the GPIB interface.

From the line filter the mains supply is fed to the mains selector and transformer TR101 which contains a built-in thermal fuse (T).

Capacitor C140 is connected between chassis and signal ground to improve signal ground to the rear panel input (EXT REF).

- ***HF Input***
  (option)

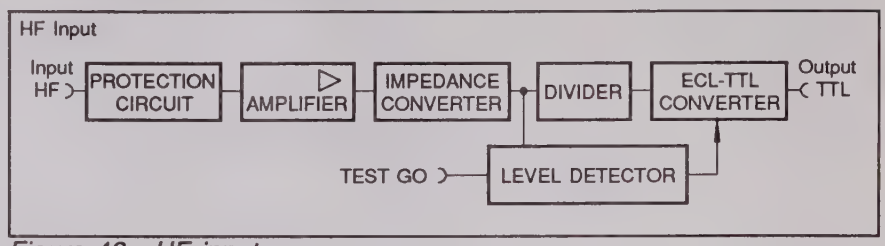

Figure 48. HF input.

The frequency range of the three types of HF Input are:

type PM 9608 100 MHz - 1.1 GHz
PM 9608B 70 MHz - 1.3 GHz
PM 9615 70 MHz - 1.0 GHz

The input, which is AC coupled, has a nominal impedance of 50 ohms. The main function of the circuit is the DIVIDER which divides the frequency by 256.

The HF Input contains following sub-functions (individually described below and on the two following pages):

- PROTECTION CIRCUIT
- AMPLIFIER
- IMPEDANCE CONVERTER
- DIVIDER
- ECL-TTL CONVERTER
- LEVEL DETECTOR

Protection Circuit

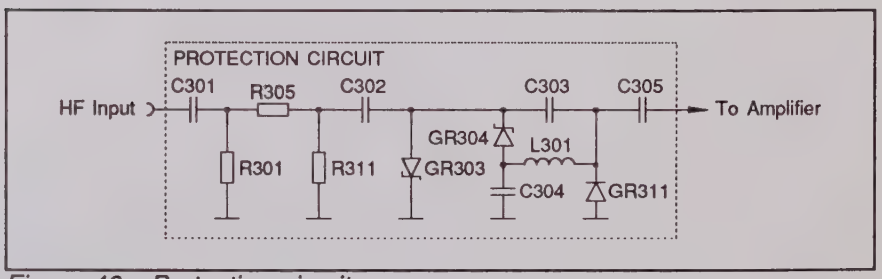

Figure 49. Protection circuit.

The HF Input is protected from excessive input levels by a resistive attenuator followed by a PIN-diode attenuator.

The resistive attenuator consists of the resistors R301, R305, and R311. The attenuation is 6 dB.

The diode attenuator consists of the components between the capacitors C302 and C305. It works in the following way:

Capacitor C304 will become negatively charged if the input amplitude increases above the forward voltage drop of the Schottky diodes GR303 and GR304.

If the DC voltage across capacitor C304 now becomes higher than the forward voltage drop across the PIN-diode GR311 (≈-0.65 V) current will flow through the diodes. This will decrease their impedance, which means that the amplitude over the diodes will be almost constant.

Amplifier

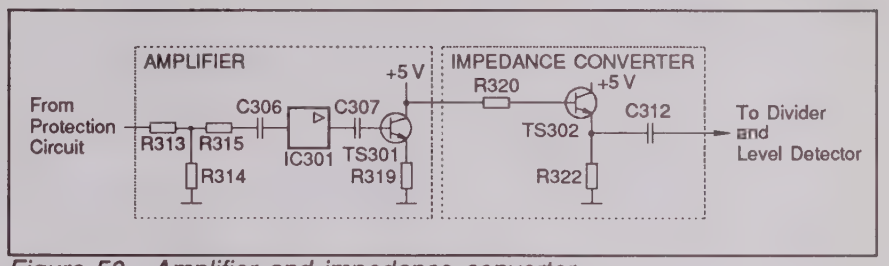

Figure 50. Amplifier and impedance converter.

An attenuator, R313...R315, reduces the signal level by 3 dB to avoid overloading of amplifier circuit IC301. The signal is amplified by about 15 dB by IC301 to compensate for the input attenuation.

TS301 amplifies by about 8 dB in the frequency range 0.9...1.3 GHz to expand the upper frequency margin for the divider circuit IC302 (after the Impedance Converter).

Impedance Converter

Transistor TS302 matches the high output impedance of the amplifier to the low input impedance of divider IC302.

Divider

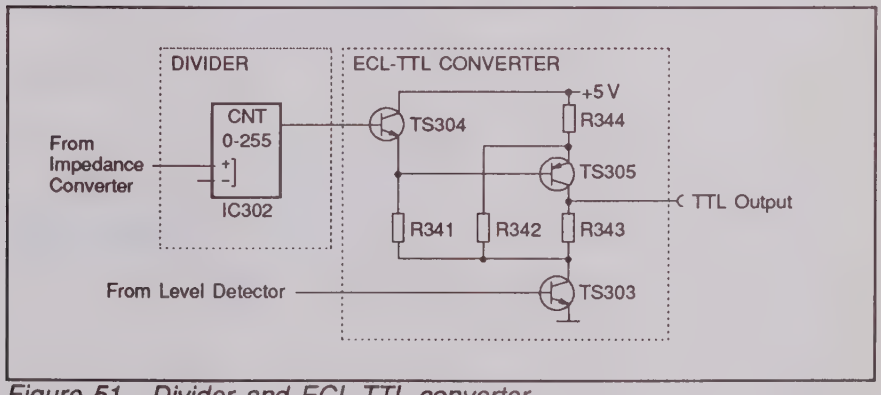

Figure 51. Divider and ECL-TTL converter.

IC302 divides the input frequency by 256, to max 5.5 MHz. This lower frequency is possible to measure by the measuring logic.

ECL-TTL Converter

The signal is converted from ECL to TTL level by the transistors TS304 and TS305 to match the measuring logic.

The conversion can be performed providing transistor TS303 is conducting. This transistor is used as an "acceptable level" switch and is controlled by a level detector.

Level Detector

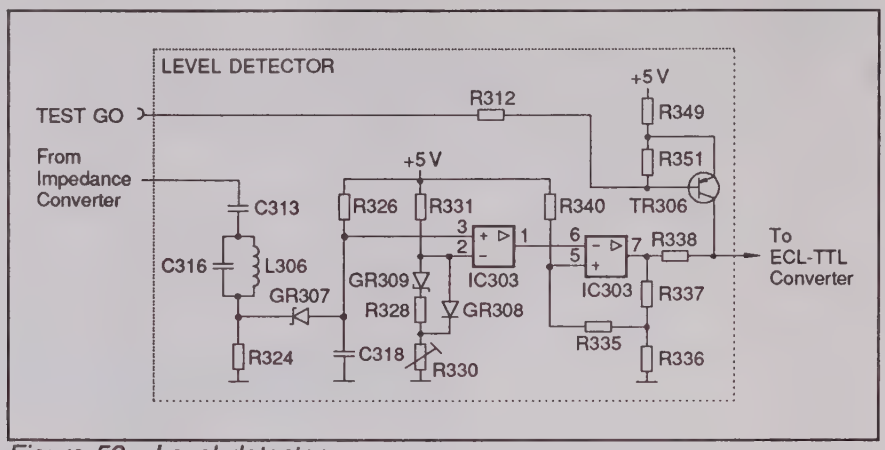

Figure 52. Level detector.

This circuit detects the lowest signal level which is acceptable for counting.

As a result of a sufficiently high input signal from the impedance converter, capacitor C318 is discharged via diode GR307, to a voltage level below the threshold level from potential divider R331/R328+R330. Pin 3 on IC303 becomes more negatively than pin 2 and the output of the amplifier, pin 1, becomes low. This amplifier stage amplifies the level by about 10 times.

The second amplifier stage, IC303, works as a Schmitt trigger. The output of this amplifier, pin 7, becomes high if the level on pin 6 sinks below the level on pin 5. Transistor TS303 in the ECL-TTL converter starts conducting.

R330 is used to set the threshold level for IC303, pin 2.

The temperature drift of the detector diode GR307 is compensated by the diodes GR308 and GR309.

For test purpose it is possible to force TS303 to conduct by connecting TEST GO (BU303 pin 5) to ground.

- ***MTCXO Oscillator***
  (option)

The PM 9607 MTCXO Oscillator cannot be repaired at a local workshop. It has to be sent to the factory for repair. Therefore only the principle is described here.

A crystal oscillator generates a frequency of 10 MHz, and a temperature oscillator generates a frequency proportional to the crystal temperature.

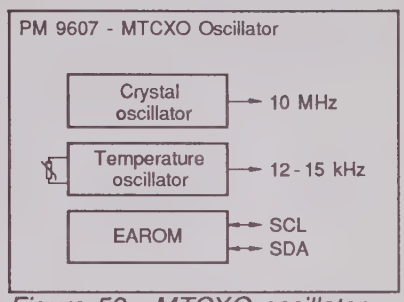

Figure 53. MTCXO oscillator.

The frequency deviations of the crystal oscillator for different temperatures are stored in an EAROM type memory.

The frequency of the temperature oscillator and the corresponding value from the EAROM is read by the Micro-Controller. This information is used to compensate the measuring result to a correct value with respect to the ambient temperature.

- ***GPIB Interface***
  (PM 6669, option)

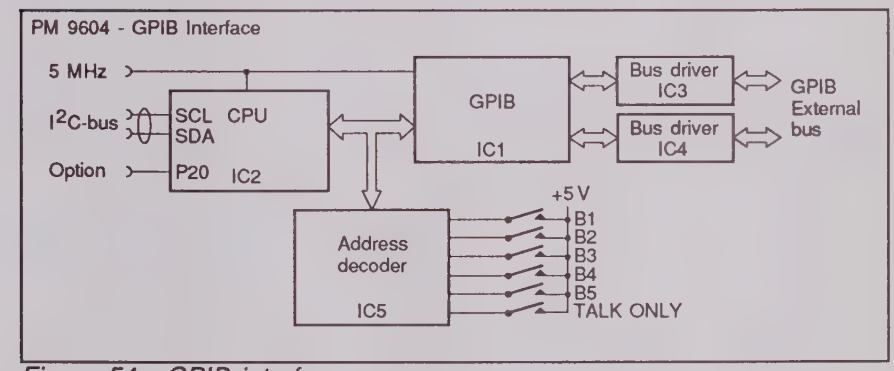

Figure 54. GPIB interface.

The PM 9604 GPIB Interface controls the communication between the internal microcontroller and the external GPIB bus.

IC2 controls the GPIB converter IC1 and works as a slave processor to the microcontroller IC105.

Address decoder IC5 reads the address switch settings into IC2.

Two bus drivers, IC3 and IC4, read and write information on the external bus.

If information is to be sent from the internal to the external bus, the main controller IC105 orders processor IC2 to address affected registers in IC1. IC2 reads the I^2C-bus and the information read is transferred to GPIB converter IC1 to be forwarded to the external bus via the I^2C-bus.

If IC1 receives information from the external bus it sends an interrupt to IC2 (pin 12). IC2 reads the information and requests attention from IC105 via signal option. IC105 fetches the information.

- ***Battery Unit***
  (option)

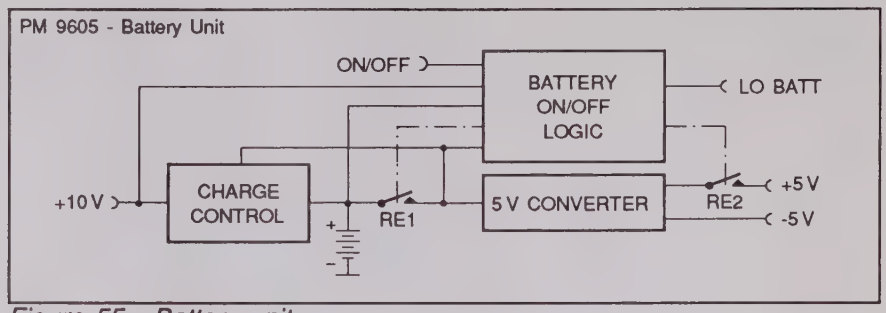

Figure 55. Battery unit.

The PM 9605 Battery Unit contains the following subfunctions, which are individually described below and on the next two pages:

CHARGE CONTROL	limits the charging current and controls the charging voltage to a maximum of 6.9 V.
5 V CONVERTER	generates and regulates the supply voltages for the counter.
BATTERY ON/OFF LOGIC	turns off the output power to protect the battery when its voltage has dropped to a certain level.

Charge Control

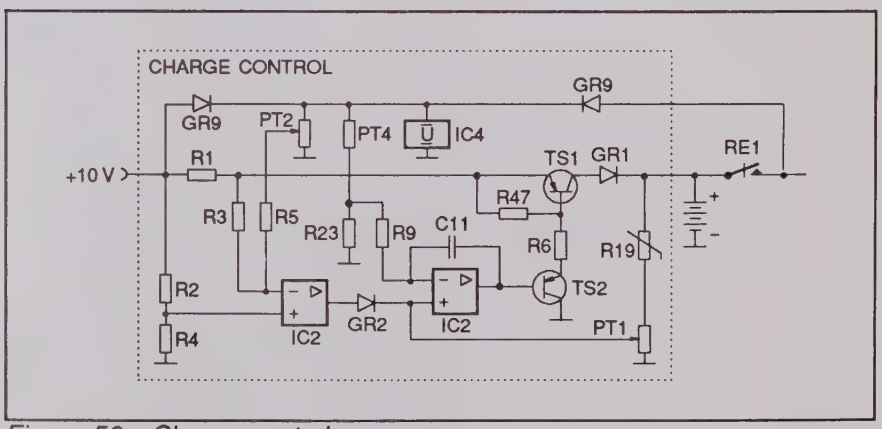

Figure 56. Charge control.

The charging current passes the Charge Control circuitry via R1, TS1, and GR1. This current causes a voltage drop across R1 which is sensed and used to regulate transistor TS1.

As a result of an increase in charging current, the voltage drop across R1 increases. This causes a higher potential difference between the sensing inputs to IC2 (via R2 and R3). The output level from this amplifier rises, as does the output level from the following amplifier as well. Transistor TS2 becomes less conducting. The base potential of TS1 rises and thus limits the charging current.

IC4 keeps a constant voltage to PT2 and PT4.
PT1 is used to set the maximum charging voltage.
PT2 is used to adjust the maximum charging current.
R19 is used for temperature compensation.

5 V Converter

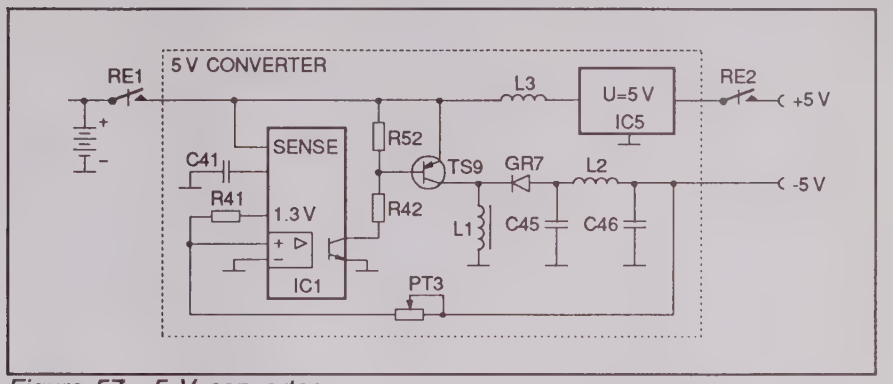

Figure 57. 5 V converter.

The 5 V converter generates -5 V and regulates +5 V and -5 V power to the counter. The input from the battery and the +5 V output is switched by the relays RE1 and RE2 controlled from the battery ON/OFF logic.

To obtain the -5 V supply, current from the battery is switched through transistor TS9. Integrated circuit IC1 generates the switching pulses for the transistor. The current pulses through TS9 cause a voltage to develop across L1. This voltage is rectified by GR7, then filtered and smoothed by C45, L2 and C46.

The output voltage is regulated to -5 V by being fed back to IC1 where it is summed with the internal reference voltage to regulate the switching pulses.

C41 sets the output frequency of IC1 to about 30 kHz.

PT3 is used to adjust the -5 V level.

-5 V power is not used by the PM 6662 counter.

Battery ON/OFF logic

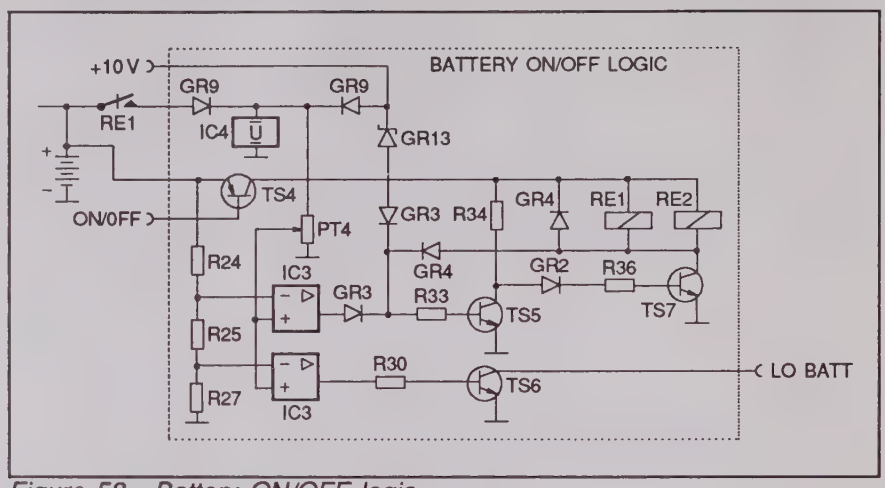

Figure 58. Battery ON/OFF logic.

The battery voltage is divided in two voltage levels by the resistors R24, R25 and R27. These two levels are individually compared to a reference voltage given from the constant voltage circuit IC4 and adjustable by PT4. The comparisons are performed by IC3 as follows:

If the battery voltage drops to the first limit, the level between R25 and R27 becomes low in comparison to the reference voltage. The output from IC3 becomes high and transistor TS6 conducts. LO BATT sends an interrupt to the Micro-Controller. The display starts to blink.

If the battery voltage drops to the second limit, below the first one, the level between R24 and R25 becomes low in the same way as above. Transistor TS5 conducts, which causes transistor TS7 cease conducting and the relays RE1 and RE2 to release.

To make sure that the battery is disconnected when the instrument is used from the mains, +10 V is fed to the base of transistor TS5 via the diodes GR13 and GR3. The transistor conducts and forces the relays to release. Because of this function, the counter must be switched on without the mains lead connected if it is to be used with battery power.

FUNCTION CHECK

Function check describes how to examine the counter to ascertain that all main functions are operational.

Preparations

Power up the instrument at least 30 minutes before checking to let it attain normal operating temperature.

Required test equipment, see page 7.

- Fit the BNC T-piece to input A, and the 50 ohm termination to the EXT REF input. Interconnect with a cable.
- Connect the HF generator to the T-piece. Set the frequency to 10 MHz ±0.1 MHz and the amplitude to 1.4 V_{p-p} (7 dBm).

Self Test

- Release the FILTER push button (PM 6669). Set the sensitivity control to 15 mV (PM 6662) or to 20 mV (PM 6669).
- Test jumper JP101 on the basic board (see figure 59) must be in the NORM position.

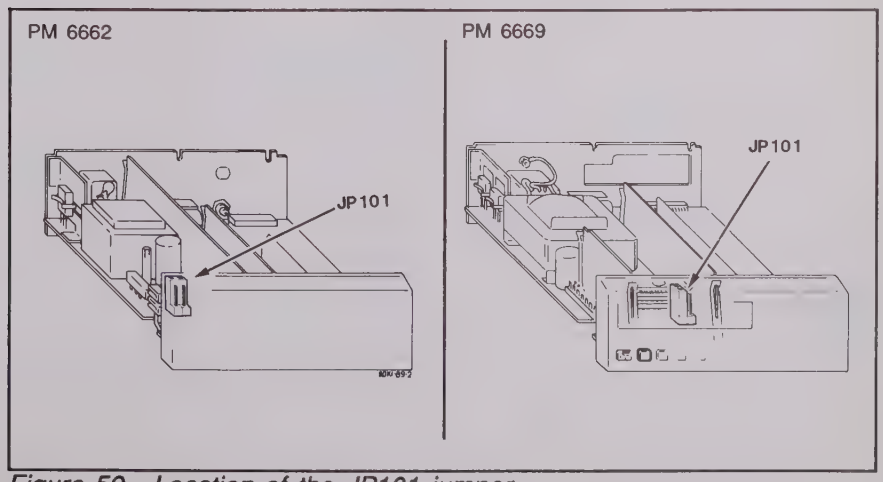

Figure 59. Location of the JP101 jumper.

- Switch on the counter. It now runs the following tests:

  Display test
  RAM test
  Measuring logic test

  The following error codes can be displayed:

  Error 01 - RAM error
  Error 02 - Measuring logic error
  Error 03 - I^2C-bus error

  Error 03 may be displayed during normal use.
  Error OF means overflow and may also be displayed during normal use.

  No displayed code means that no error was found.

Measuring Time

- Run the counter with the measuring times below and read the display. The values read shall be as in the table below.

MEAS TIME	Display values
0.2 s	10.00000 MHz ±1 in the last digit
1.0 s	10.000000 MHz ±1 in the last digit
10.0 s	10.0000000 MHz ±1 in the last digit
Single (PM 6669)	10.000 MHz ±1 in the last digit

Display Hold
(PM 6669)

- Press the DISPL HOLD button. The instrument shall stop counting when the current measurement is completed. The DISPL HOLD indicator shall then appear.
- Press the DISPL HOLD button again. The DISPL HOLD indicator shall disappear and the instrument shall count and display the values again.

RPM A
(PM 6669)

- Select RPM A.
- Select measuring time 0.2 s.
- The instrument shall now count and display 600.000 M.

PERIOD A
(PM 6669)

- Select PER A.
- Select measuring time 0.2 s.
- The instrument shall now count and display 100.0000 ns.

FREQ A/A_0
(PM 6669)

- Select FREQ A.
- Select measuring time 0.2 s.
- Keep the STORE A_0 button pressed until the counter starts counting.
- Select A/A_0.
- The instrument shall now count and display 1.000000.

FREQ A-A_0
(PM 6669)

- Select A-A_0.
- The instrument shall now count and display 00.00000.

TOT A
(PM 6669)

- Select TOT A.
- Press TOTALIZE START/STOP once. The instrument shall now count.
- Press the button once again. The instrument shall now stop counting.
- Hold the button depressed for about 1 sec. The counter shall be reset and display zero.

BLANK DIGITS
(PM 6669)

- Select FREQ A.
- Press BLANK DIGITS. The instrument shall now display 10.0000-.
- Press BLANK DIGITS again. The instrument shall display 10.000--.
- Repeat until the display shows --.-----.
- Press BLANK DIGITS once more. The instrument shall display 10.00000.

Push Buttons

- Switch off the counter.
- Move jumper JP101 inside the counter to the TEST position.
- Switch on the counter.
- Press the CALIB button inside the counter, see figure 60.

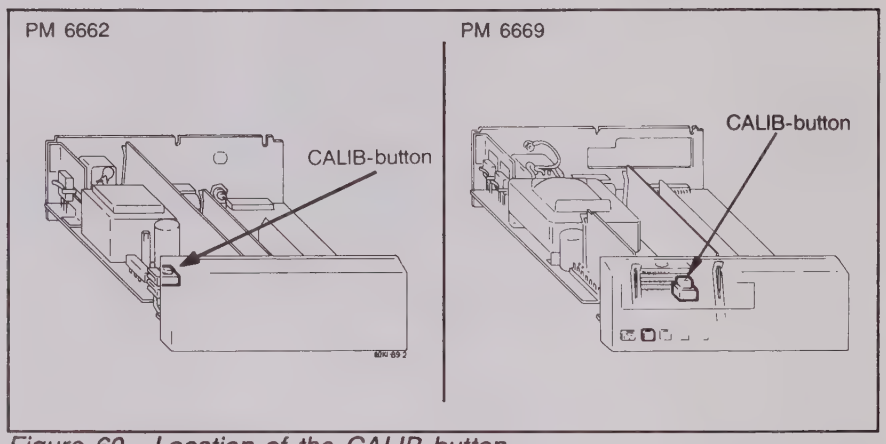

Figure 60. Location of the CALIB button.

- The displayed identity/option code shall be in accordance with the applicable code in the following table.

Code	Oscillator	GPIB	HF Input	6662	6669
8.8	Std.			X	
8.9	Std.		Included	X	
8.-	MTCXO			X	
8.	MTCXO		Included	X	
8.3	MTCXO		Included		X
8.2	MTCXO				X
8.0	Std.				X
8.1	Std.		Included		X
9.3	MTCXO	Included	Included		X
9.2	MTCXO	Included			X
9.0	Std.	Included			X
9.1	Std.	Included	Included		X

- Press the buttons listed in the following table. The displayed codes shall be in accordance with the codes in the following button code table.

Button	Code	6662	6669
RESET	2.0		X
MEASURING TIME	2.1	X	X
FUNCTIONS	2.2		X
DISPLAY HOLD	3.0		X
BLANK DIGITS	3.1		X
TRIGGER LEVEL A	3.2		X

- Turn off the counter.
- Move jumper JP101 to the NORM position.

PERFORMANCE CHECK

Performance check describes the measuring methods and data necessary to verify correct signal values and voltage levels in the counter. After completed "Performance Check" the counter will meet the specifications published in the Operators' Manual.

Preparations

Power up the instrument at least 30 minutes before checking to let it attain normal operating temperature.

Required test equipment, see page 7.

Oscillator

To check the accuracy of the oscillator, use a reference with an accuracy of at least $3 \cdot 10^{-8}$. The PM 9691 oven-enclosed oscillator used in Philips counters version /.5. meet this requirement, if calibrated.

• Uncompensated Crystal Oscillator

- Connect the external 10 MHz reference to input A.
- The counter should display 10 MHz ±150 Hz. This is the maximum deviation after one year of ageing (±50 Hz) plus the maximum deviation due to temperature (±100 Hz).

• MTCXO Oscillator *(option)*

- Connect the external 10 MHz reference to input A.
- The counter should display 10 MHz ±7 Hz. This is the maximum deviation after one year of ageing (±5 Hz) plus the maximum deviation due to temperature (±2 Hz).

Input A

• Sensitivity and Frequency Range

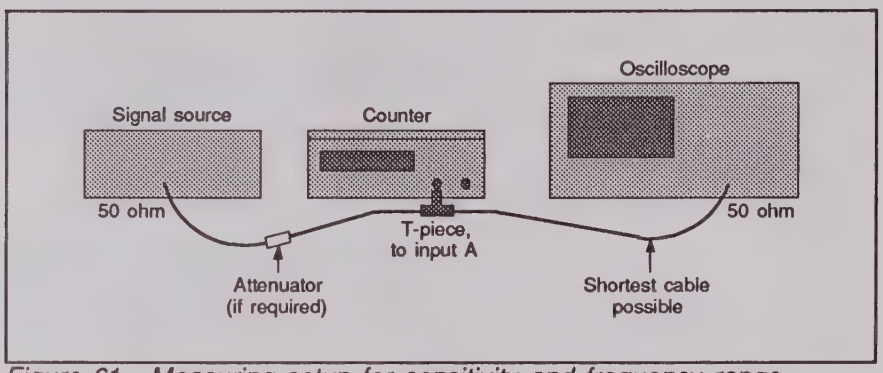

Figure 61. Measuring setup for sensitivity and frequency range.

- Connect the HF generator (via an attenuator if required) to the BNC T-piece. Connect the T-piece to input A, see figure 61.
- Connect the T-piece to the 350 MHz oscilloscope. Use as short cable as possible.
- Select function FREQ A (PM 6669).
- Set the counter to maximum sensitivity.
- Adjust the amplitude of the signal source to the minimum level accepted by the counter.
- Read the amplitude on the oscilloscope.
- The instrument shall count correctly with the following sine wave input signals:

PM 6662:		PM 6669:	
Frequency	**Sine wave**	**Frequency**	**Sine wave**
1 MHz	42 mV_{p-p} (-23 dBm)	1 MHz	28 mV_{p-p} (-27 dBm)
25 MHz	42 mV_{p-p} (-23 dBm)	70 MHz	28 mV_{p-p} (-27 dBm)
80 MHz	84 mV_{p-p} (-17 dBm)	120 MHz	28 mV_{p-p} (-27 dBm)
120 MHz	84 mV_{p-p} (-17 dBm)		

• Filter (PM 6669)

- Connect the LF synthesizer to input A.
- Set the synthesizer frequency to 200 kHz sine wave and the amplitude to 0.20 V_{p-p} (-10 dBm).
- Push the SENSITIVITY potentiometer to the 10 mV state.
- Press the FILTER button.
- The counter shall not count the signal when the filter is on.

- ***Sensitivity Switch***
  (PM 6662)

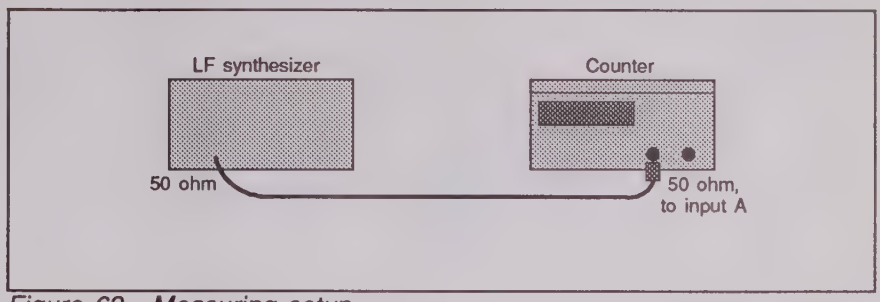

Figure 62. Measuring setup.

- Connect the LF synthesizer to input A via the 50 ohm termination, see figure 62.
- Set the frequency to 1 kHz, sine wave.
- Set the amplitude to 15 mV_{rms} (42 mV_{p-p}).
- Set the SENSITIVITY switch of the counter to 15 mV_{rms}, see figure 63.
- The instrument shall count correctly.
- Repeat the procedure for 50 - 150 mV_{rms} and 0.5 - 1.5 - 5 V_{rms} with the input values from the table below.

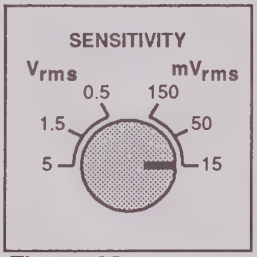

Figure 63.

Switch setting:	Correct counting at:
15 mV_{rms}	42 mV_{p-p}
50 mV_{rms}	141 mV_{p-p}
150 mV_{rms}	424 mV_{p-p}
0.5 V_{rms}	1.41 V_{p-p}
1.5 V_{rms}	4.24 V_{p-p}
5 V_{rms}	14.1 V_{p-p}

- ***Sensitivity Potentiometer Range***
  (PM 6669)

- Connect the LF synthesizer as described in the previous section, see figure 62.
- Set the frequency to 200 kHz, sine wave.
- Turn the SENSITIVITY potentiometer (10 mV state) to fully counter clockwise, see figure 64.
- Set the LF synthesizer to the minimum amplitude for correct counting.
- Pull the potentiometer to the 200 mV state and turn it fully to the right-hand end position (fully clockwise).
- The instrument shall count correctly.

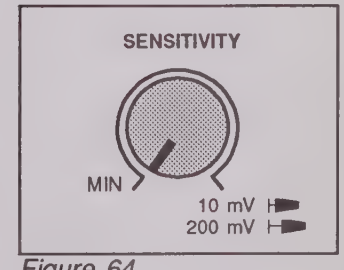

Figure 64.

- ***Trigger Level***
  (PM 6662)

- Connect the LF synthesizer as described on page 47, figure 62.
- Set the synthesizer signal in accordance with the symmetrical pulse train, the positive pulse train and the negative pulse train in figure 65 below.
- The instrument shall count the three different signals correctly without any manipulation.

- ***Trigger Level***
  (PM 6669)

- Connect the LF synthesizer as described on page 47, figure 62.

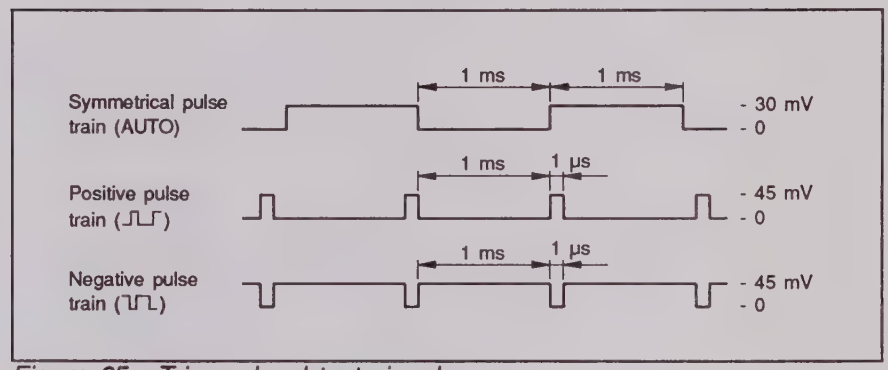

Figure 65. Trigger level test signals.

Symmetrical pulse train

- Set the synthesizer signal in accordance with the symmetrical pulse train in figure 65.
- Select TRIGGER LEVEL A; AUTO.
- The instrument shall now count and display 500 Hz.

Positive pulse train

- Set the synthesizer signal in accordance with the positive pulse train in figure 65.
- Press the RESET button.
- The instrument shall count and display 1 kHz.
- Select TRIGGER LEVEL A; ⎍⎍⎍.
- The instrument shall count correctly.

Negative pulse train

- Select TRIGGER LEVEL A; AUTO.
- Set the synthesizer signal in accordance with the negative pulse train in figure 65.
- Press the RESET button.
- The instrument shall count and display 1 kHz.
- Select TRIGGER LEVEL A; ⎍⎍⎍.
- The instrument shall count and display 1 kHz.
- Select TRIGGER LEVEL A; AUTO.
- The instrument shall count correctly.

- ***EXT REF Sensitivity***

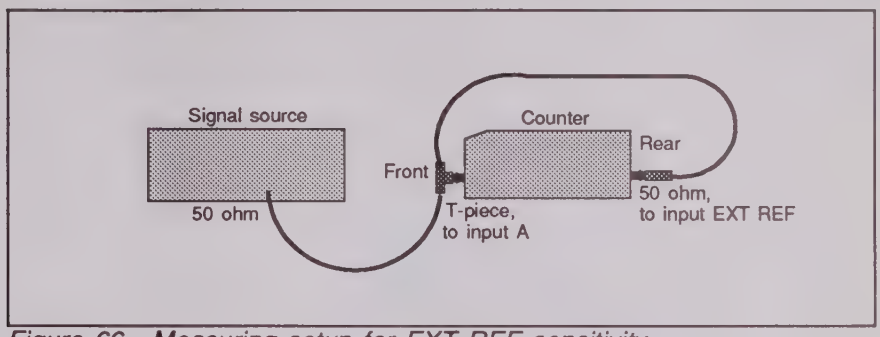

Figure 66. Measuring setup for EXT REF sensitivity.

- Select FREQ A (PM 6669).
- Fit a BNC T-piece to input A, and a 50 ohm termination to the EXT REF input, see figure 66.
- Connect a cable to the T-piece, and feed in a 10 MHz ±0.1 MHz, 1.4 V_{p-p} (7 dBm) sine wave signal.
- Make sure that the counter indicates EXT REF.
- The instrument shall now count and display 10 MHz.

- ***Input B Auto Switch***
  (PM 6662)

- Connect the LF synthesizer as described on page 47, figure 62.
- The instrument shall count correctly and indicate FREQ A.
- Connect the HF signal generator to input B while the LF synthesizer still feeds input A.
- Set the frequency of the HF signal generator to 100 MHz - 1.3 GHz.
- The instrument shall now count the signal from input B and indicate FREQ B.

HF Input
(option)

Let the HF Input be in use in at least 10 minutes before checking it.

Required test equipment, see page 7.

- ***Sensitivity***

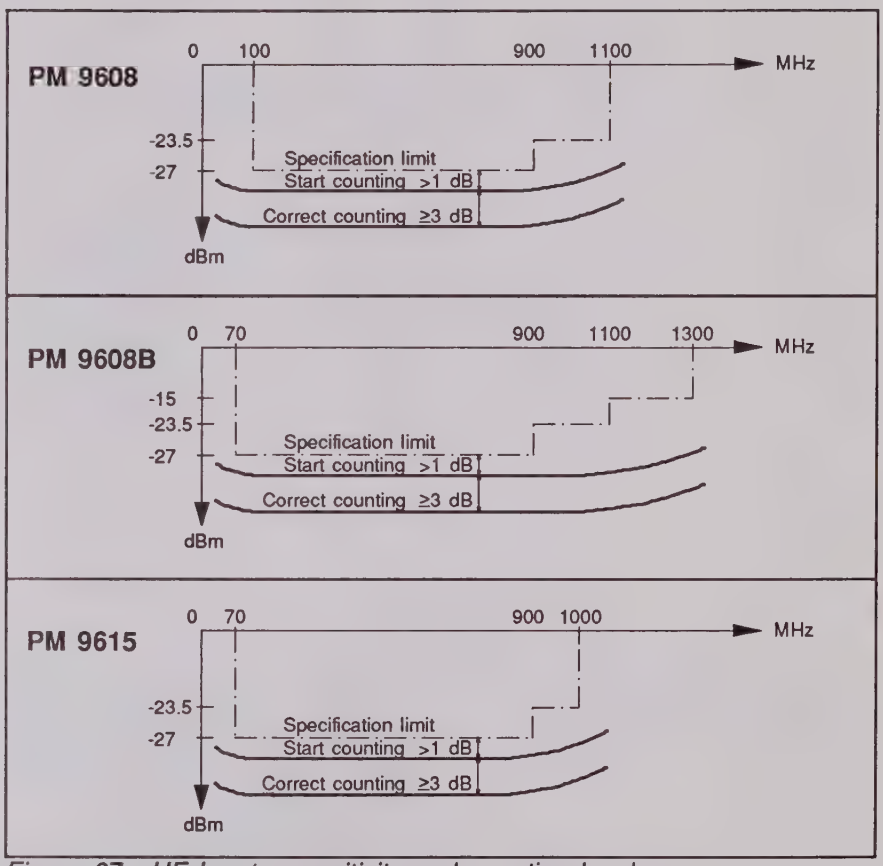

Figure 67. HF Input - sensitivity and counting levels.

- Connect the sweep generator to the HF input.
- Set the generator signal to the following frequency:

  type PM 9608 100 MHz
  PM 9608B 70 MHz
  PM 9615 70 MHz

- Decrease the amplitude from the generator until the instrument stops counting.
- Increase the amplitude slowly until the instrument starts counting again. Read the value.

  NOTE: Compensate for the losses in the coaxial cable when reading the value (about 1 dB/m for RG/M58 at 1.3 GHz).

- The "start counting" level shall be more than 1 dB below the specified limit shown in figure 67.
- Repeat this procedure with the following frequencies:

  type PM 9608 200, 300, ... up to 1100 MHz
  PM 9608B 100, 200, ... up to 1300 MHz
  PM 9615 100, 200, ... up to 1000 MHz

GPIB Interface
(PM 6669, option)

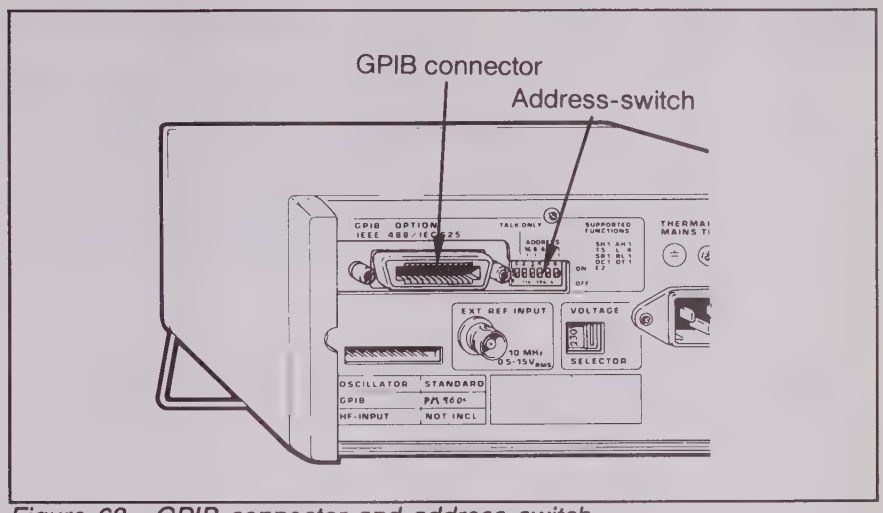

Figure 68. GPIB connector and address switch.

The test is intended for an HP-85 controller.

- Make sure that the TALK ONLY switch (the leftmost switch in the address switch block) is set to "0".
- Address the counter and execute the following sequence.

Type on the controller	This should happen
REMOTE 710	The remote indicator should be switched on.
OUTPUT 710;"ID?"	Ask for the counter identity.
ENTER 710;A$	Input result from the counter.
DISP A$	The response on the display of the controller is the identity of the counter.

The counter will, if everything is correct, identify itself as:

PM6669/YZW/MN

where Y = 4 if the counter has an HF Input, otherwise 0.
Z = 3 for MTCXO, otherwise 1.
W = 6 (GPIB-bus is installed).
M = Revision No. of counter firmware.
N = Revision No. of GPIB-bus firmware.

Battery Unit
(option)

Check the capacity of the battery in the following way:

- Charge the battery during a period of 24 hours.
- Make sure that the capacity of the battery is sufficient to drive the counter for at least 2.5 hours.

ADJUSTMENTS

This chapter describes adjustment procedures which may need to be performed occasionally, and which must be performed after repair.

Preparations

Power up the instrument at least 30 minutes before checking to let it attain normal operating temperature.

Required test equipment, see page 7.

Oscillator

To check the accuracy of the oscillator, use a reference with an accuracy of at least $3 \cdot 10^{-8}$. The PM 9691 oven-enclosed oscillator used in Philips counters version /.5. meet this requirement, if calibrated.

• Uncompensated Crystal Oscillator

- Connect the external 10 MHz reference to input A.
- Use the screwdriver specified in *"Required test equipment"* on page 7 and set the oscillator frequency as follows:

PM 6662:

- Set the oscillator frequency to 10 MHz ±10 Hz by adjusting the trimmer capacitor C135 on the basic board. The location of this capacitor can be seen in figure 69 on page 55.

PM 6669:

- Set the oscillator frequency to 10 MHz ±10 Hz by adjusting the trimmer capacitor C403 on the oscillator board.

- ***MTCXO Oscillator*** *(option)*

The MTCXO must have a reasonably stable temperature when being calibrated.

Follow the instructions carefully.

If you remove the cover when the counter has been switched on, the temperature of the MTCXO will drop rapidly by about 10°C. Since the MTCXO must have a stable temperature when being calibrated, you must not calibrate until one hour after removing the cover.

If the counter has been switched off for more than three hours, you can calibrate it directly.

- Connect the external 10 MHz reference to input A.
- Select measuring time 1 s.
- The instrument shall display 10 MHz ±2 Hz
- Depress the MEAS TIME button (PM 6662) or the RESET (PM 6669) on the front panel while holding down the "CALIB" (calibration) button on the basic board inside the instrument.

  The component number of the CALIB button is SK102 in the PM 6662 counter, SK103 in the PM 6669.
- The counter selects FREQ A and measuring time 10 s.
- During the first measuring period, the difference between the old and the new value will be displayed.
- The MTCXO calibration is completed when the counter displays 10 MHz ±0.1 Hz after several measuring periods of 10 s length.

Input A

- **Schmitt Trigger**
  (PM 6662)

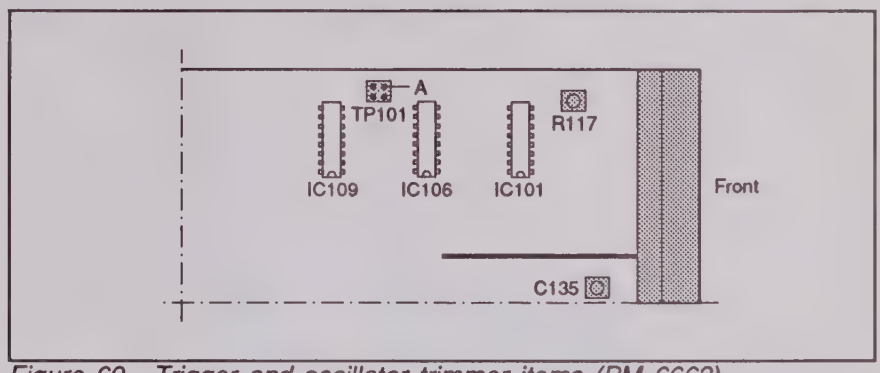

Figure 69. Trigger and oscillator trimmer items (PM 6662).

- Connect the external 10 MHz reference to the EXT REF input via the 50 ohm termination.
- Connect the LF synthesizer to input A.
- Set the synthesizer to a sine wave signal with a frequency of 1 kHz and an amplitude of 42 mV_{p-p} (-23 dBm).
- Select measuring time 0.2 s.
- The instrument shall count and indicate EXT REF on the display.
- Connect the probe of the oscilloscope to TP101:A, see figure 69.
- Adjust potentiometer R117 to make the square wave symmetrical.

- **Schmitt Trigger**
  (PM 6669)

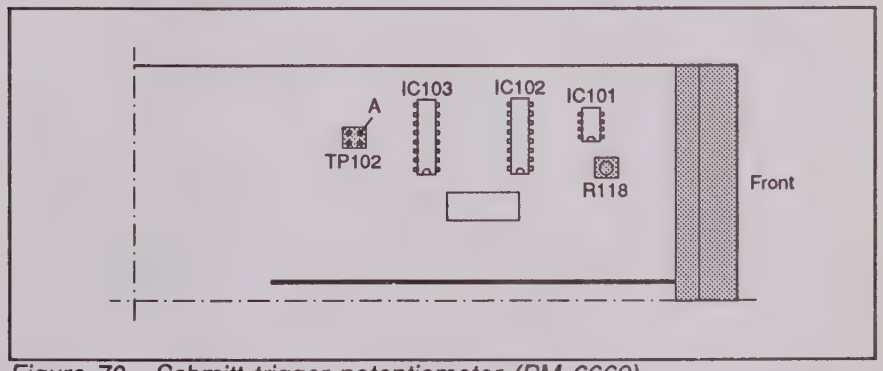

Figure 70. Schmitt trigger potentiometer (PM 6669).

- Connect the external 10 MHz reference to the EXT REF input via the 50 ohm termination.
- Connect the LF synthesizer to input A.
- Set the synthesizer to a sine wave signal with a frequency of 1 kHz and an amplitude of 25 mV_{p-p} (-28 dBm).
- Select measuring time 0.2 s.
- The instrument shall count and indicate EXT REF on the display.
- Select WIDTH A ⎍ and TRIGGER LEVEL A ⎍⎍.
- Connect the probe of the oscilloscope to TP102:A, see figure 70.
- Adjust potentiometer R118 to make the square wave symmetrical.
- The instrument shall display 500.0 µs, ±10 µs.

HF Input
(option)

Allow the HF Input to make a measurement for at least 10 minutes before adjusting it.

Required test equipment, see page 7.

- Connect the sweep generator to the HF input.
- Set the frequency to 900 ±25 MHz.
- Set the amplitude to 7.5 ±0.5 mV_{rms} (-29.5 ±0.5 dBm).
- Turn potentiometer R330 fully clockwise. The GATE indicator stops blinking. Turn R330 slowly counterclockwise until the GATE indicator starts blinking again. The input frequency shall now be displayed.

Battery Unit *(option)*

The battery unit must be installed in a counter during testing.

Required test equipment, see page 7.

• Charging Voltage

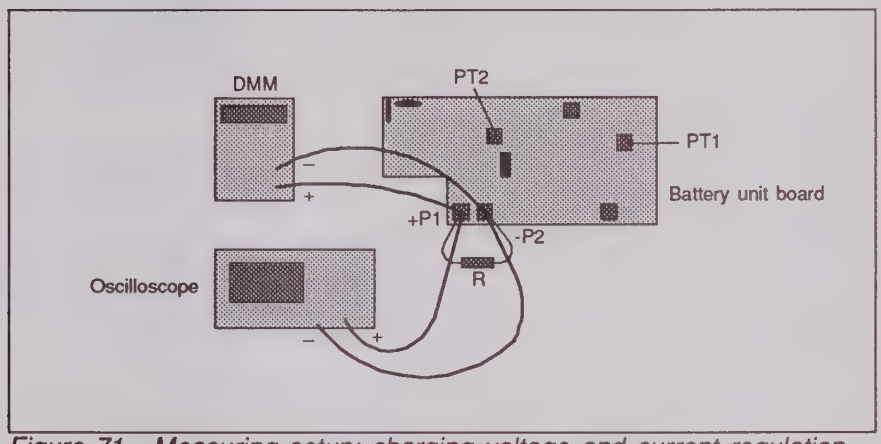

Figure 71. Measuring setup; charging voltage and current regulation.

- Disconnect the battery from the battery unit.
- Connect the 100 ohm/0.5 W resistor between P1 and P2. The resistor is shown as "R" in figure 71.
- Connect the DMM and the oscilloscope to P1 and P2.
- Switch on the counter.
- Adjust the charging voltage with PT1 in accordance with the ambient temperature table.
- The ripple shall not exceed 20 mV_{p-p}.
- Turn off the counter and remove the resistor.
- Reconnect the battery.

Ambient temperature		Voltage
18-20°C	64-68°F	6.91 V*
21-23°C	69-74°F	6.86 V*
24-26°C	75-79°F	6.81 V*

*Tolerance: +0.02 V, -0.05 V

• Current Regulation

- Disconnect the battery.
- Connect the 1 ohm/0.5 W resistor between P1 and P2. The resistor is shown as "R" in figure 71 above.
- Connect the DMM and the oscilloscope to P1 and P2 as shown in the same figure.
- Switch on the counter.
- Read the DMM while adjusting PT2 to get 500 mV ±20 mV.
- The ripple shall not exceed 40 mV_{p-p}.
- Turn off the counter and remove the resistor.
- Reconnect the battery.

- ***-5 V Regulation***

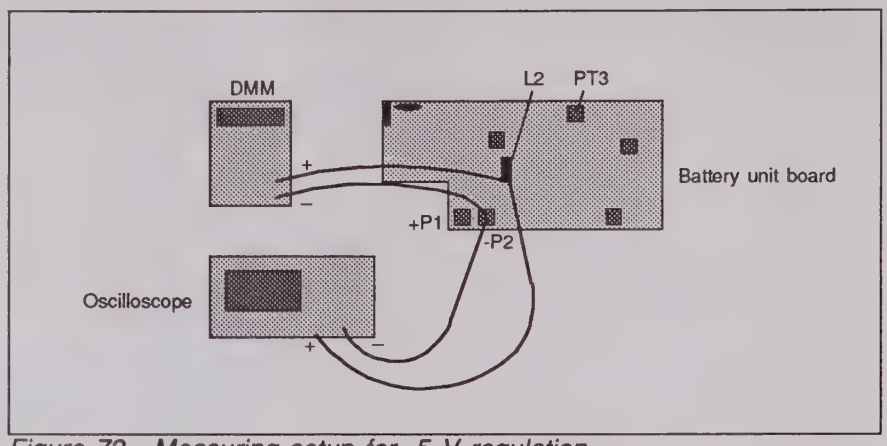

Figure 72. Measuring setup for -5 V regulation.

- Disconnect the battery from the battery unit.
- Connect the DMM and the oscilloscope between -5 V (L2 in figure 72) and ground (P2).
- Switch on the counter.
- Read the DMM while adjusting PT3 to get -5 V ±0.1 V.
- The ripple shall not exceed 60 mV_{p-p}.
- Reconnect the battery.

- ***Low Battery Sensing***

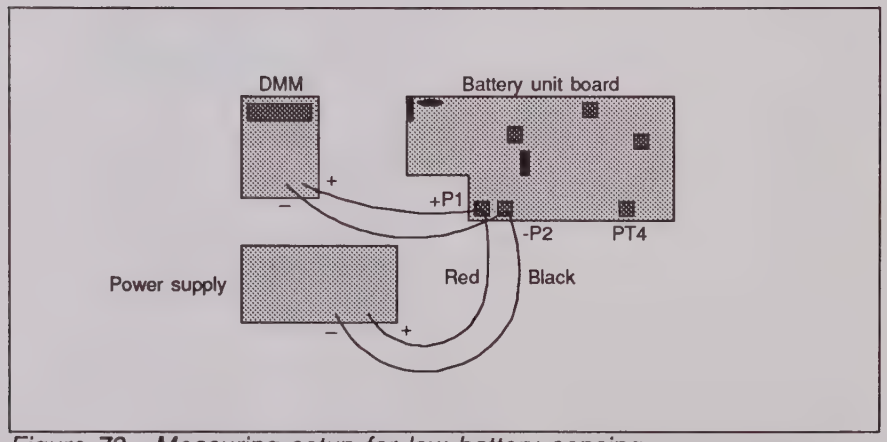

Figure 73. Measuring setup for low battery sensing.

- Disconnect the battery from the battery unit.
- Connect the DMM to P1 and P2.
- Connect the power supply between P1 and P2.
- Set the voltage from the power supply to 5.3 V ±0.05 V
- Adjust PT4 until the display starts blinking.
- Reconnect the battery.

REPAIR

Read the following *"Safety Inspection after Repair"* before commencing any repair on the unit.

Power up the instrument at least 30 minutes before measuring to let it attain normal working temperature.

Required measuring equipment, see page 7.

Safety Inspection after Repair

Make sure that creeping distances and clearances have not been reduced.

The condition and correct connection of the protective earth must be checked by visual inspection and by measuring the resistance between the protective lead at the plug and the cabinet. The resistance must not be more than 0.5 ohm. Move the power cord during the measurement. Resistance variations indicate a defect.

Logic Levels

The PM 6662 and PM 6669 counters contain logic of four families. The levels for these families are listed in the following table.

	LOGIC FAMILY			
	ECL positive	**ECL negative**	**CMOS**	**TTL**
Supply voltage designation	+5 V_{CC}	-5 V_{EE}	+5 V_{DD}	+5 V_{CC}
Signal ground designation	0 V_{EE}	0 V_{CC}	0 V_{SS}	0 GND
Input voltage				
High, V_{IH}	>+3.9	>-1.1	>+4	>+2
Low, V_{IL}	<+3.5	<-1.5	<+1	<+0.8
Output voltage				
High, V_{OH}	>+4	>-1	>+4.9	>+2.7
Low, V_{OL}	<+3.3	<-1.7	<+0.05	<+0.4
Bias ref. voltage, V_{BB}	+3.7	-1.3	-	-

All values in volt.

Fault-Finding

This fault-finding guide is intended to be used as follows:

Read the *"General"* section, which contains information on the built-in-test program.

Use the following fault-finding tree to find the source of the fault. This tree takes you, if appropriate, to the sections *"Extended Test Program"*, *"Counting Fault"*, and *"Faulty Push Button"*.

The three last sections of this chapter, *"HF Input"*, *"MTCXO Oscillator"*, and *"Battery Unit"* contain instructions for these option circuits not included in the fault-finding tree.

• General

When the instrument is switched on, it automatically runs an initial test program. This program contains display-, RAM-, and measuring logic tests. After completing these tests the instrument automatically enters the operational mode.

If the test jumper is moved from the NORM to the TEST position, the instrument starts an extended test program when the power is switched on. This test is described under *"Extended Test Program"*.

If the CALIB button on the basic board is pressed in test mode (with the jumper in the TEST position), a test sub-program is started. This program performs a test of the display circuitry. The program then displays identity/option code and activated button code. The tables of these codes are given on page 44 under *"Push Buttons"*.

- ***Fault-Finding Tree***

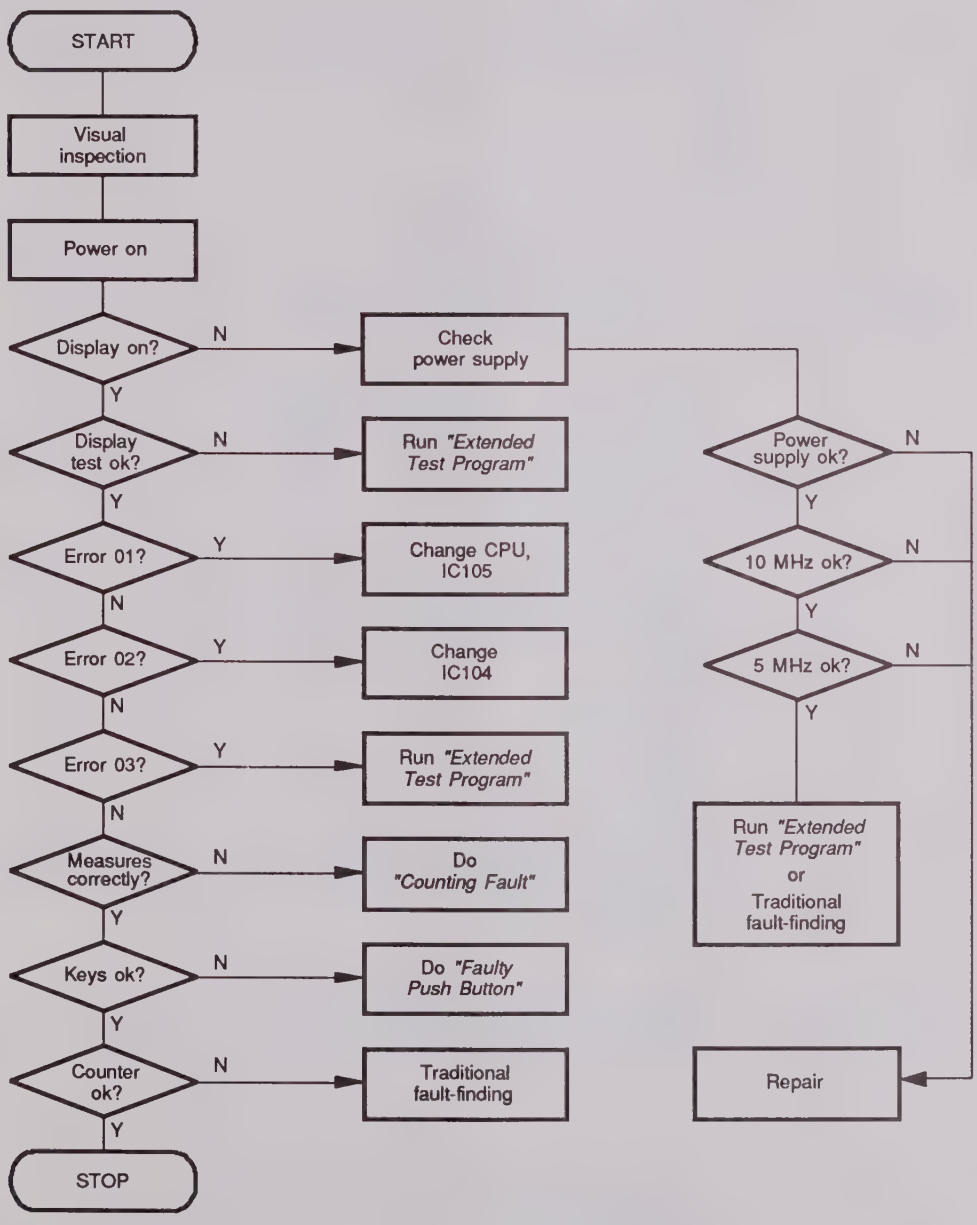

Figure 74. Fault-finding tree.

• Extended Test Program

To understand this description, you must understand the function of the I^2C-bus. This is described under *"Micro-Controller and I^2C-bus"* in the chapter on *"Functional Description"*.

With the aid of an oscilloscope, all the test signals can be examined and followed through the circuitry. Oscilloscope settings, see below.

- Switch off the counter.
- Move the test jumper on the basic board to the TEST position.
- Switch on the counter. The display shall remain blank.

As the jumper was in the TEST position when the counter was switched on, the built-in *"Extended Test Program"* controls the processor of the counter. This program contains instructions which order the processor to generate and send test signals via its own out-ports, and also sequences of test signals on the I^2C-bus.

Slaves connected to the I^2C-bus and addressed by the test signals shall acknowledge the addressing. Notice that the MTCXO oscillator and the GPIB interface (PM 6669) are options and thus will acknowledge the addressing only if they are installed.

The test-signal pattern, shown in figure 75, has a repetition time of about 1.2 ms.

"Pin" in the same figure gives the pin numbers of the processor.

The levels of port 2.2 and port 2.1 are fixed during the cycle periods of 1.2 ms. Between these periods they change their levels in binary up-counting sequences:

00 01 10 11 00 ..... and so on

Port 2.1 is changed between every period. Port 2.2 is changed between every other period.

Measuring setup for the oscilloscope:

- Set negative trig slope on port 2.0 (the best measuring port) or SDA.
- Set MTB to 0.1 ms/div. Use the variable control to stabilize the trace.
- Set DTB to 20 µs/div to monitor the I^2C-bus.

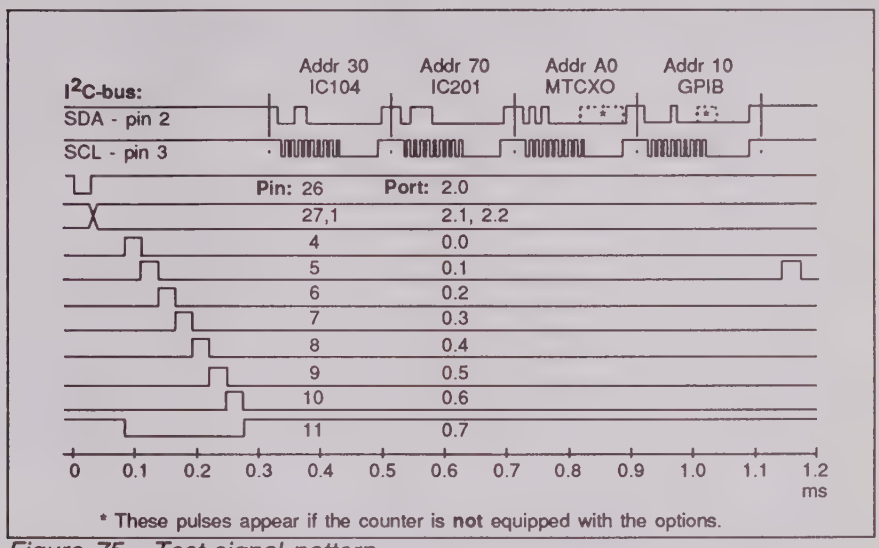

Figure 75. Test-signal pattern.

Signal sequence:

Port	2.0	30 µs negative pulse
Port	2.1 and 2.2	binary up-counting
Port	0.0	30 µs positive pulse - port 0.7 goes low
Port	0.1	30 µs positive pulse
Port	0.2	30 µs positive pulse
Port	0.3	30 µs positive pulse
Port	0.4	30 µs positive pulse
Port	0.5	30 µs positive pulse
Port	0.6	30 µs positive pulse - port 0.7 goes high
I^2C-bus	address 30H	IC104
I^2C-bus	address 70H	display driver IC201
I^2C-bus	address A0H	MTCXO oscillator
I^2C-bus	address 10H	GPIB interface
Port	0.1	30 µs positive pulse

NOTE

The PM 6662 cannot be equipped with the GPIB interface.

- ***Counting Fault***

- Switch on the counter.
- Connect the LF synthesizer to input A.
- Set the frequency to 10 kHz sine wave.
- Set the signal amplitude to 0.5 V_{p-p}.
- Connect the oscilloscope probe to IC104 pin 3 (APRI).

The frequency of the input signal, divided by 10, shall be displayed as a CMOS square-wave signal.

If this signal is missed, try to manipulate the input controls.

No signal at IC104 pin 3 indicates an input amplifier fault.

Miscounting in spite of correct signal at IC104 pin 3 indicates a fault in the IC104 circuit or an incorrect reference signal to the IC104.

- PM 6669 only: Move the probe to IC104 pin 2 (A). The 10 kHz input signal shall be displayed. This signal is used for single period measurements, among other things.

If no counting is performed, but correct signals are entered the IC104 circuit, run the *"Extended Test Program"* to check the internal communication between the ICs. Correct signal pattern on the I^2C-bus in this test indicates a fault in the IC104 circuit.

Perform the procedure *"Faulty Push Button"* to verify correct codes for identity, options, and buttons.

- ***Faulty Push Button***

- Switch off the counter.
- Move the test jumper on the basic board to the TEST position.
- Switch on the counter.
- Press the CALIB button on the basic board.

The counter shall display correct codes for pushed buttons. The tables for the codes are given on page 44 under *"Push Buttons"*.

If the counter displays a code without a button being pushed, either that button is conducing all the time, or the decoding circuitry is faulty.

A faulty decoding circuitry can be detected by reading the test pattern in the *"Extended Test Program"*, see page 62.

• *HF Input (option)*

Power up the instrument at least 10 minutes before measuring to let it attain normal working temperature.

Required measuring equipment, see page 7.

Counting Level

- Interconnect TP1 (BU302) and TP2 (BU304). The location of these can be seen in figure 76 on page 66.
- Perform the *"Sensitivity"* check described on page 50.
- Decrease the level from the "start counting" level until the instrument counts incorrectly. Increase the level again until the instrument counts correctly.

  The lowest level for which the instrument counts correctly shall be equal to, or more than 3 dB below the start counting level, see the diagram on page 50. If not, perform the *"Input Protection and Amplifier"* check (page 66).

  If the HF input passes the *"Input Protection and Amplifier"* check but fails the *"Counting Level"* check, the divider is faulty.

- Disconnect TP1 (BU302) from TP2 (BU304).

Input Protection; DC Levels

- Test jumper JP101 shall be in the NORM position.
- Switch on the counter.
- Connect the oscilloscope to the node GR304-C304-R312-L301.
- Connect the pulse generator to the HF input.
- Set the generator frequency to 100 MHz.
- Set the signal amplitude to 16 dBm (4 V_{p-p}) square wave.

  The DC level shall be between -200 mV and -600 mV.

  If the DC level is equal to or lower than -800 mV, GR311 is probably an open circuit.

  If the DC level is equal to or lower than -50 mV, GR311 is probably short-circuited or GR303/GR304 faulty.

- Move the oscilloscope probe to the node GR303-GR304-C302-C303.

  The DC level shall be between -100 mV and -300 mV.

  If the DC level is higher than +600 mV then GR303 may be open circuit.

  If the DC level is lower than -600 mV then GR304 may be open circuit.

  If either of the diodes GR303 or GR304 is short-circuited, the DC level will be almost 0 volts.

Input Protection and Amplifier

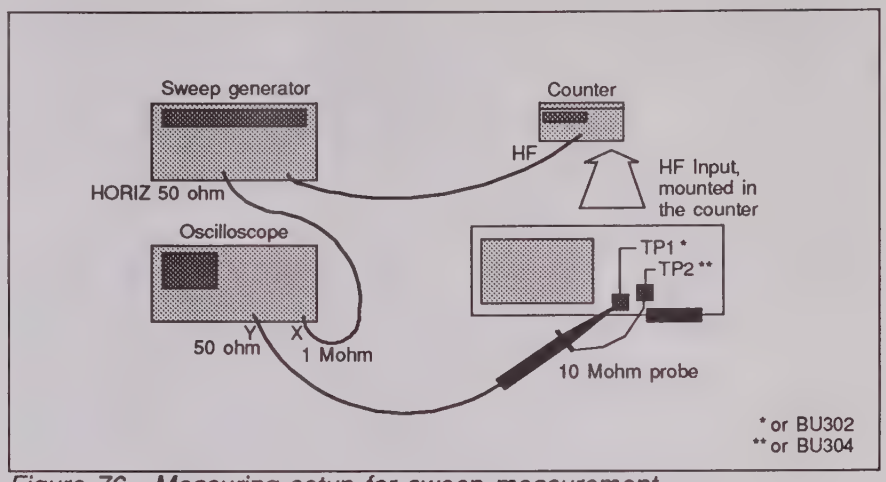

Figure 76. Measuring setup for sweep measurement.

- Connect the sweep generator to the HF input.
- Connect the horizontal output from the generator to the X channel of the oscilloscope.
- Connect the Y channel of the oscilloscope to BU302 and BU304 (ground) via the 10 Mohm probe.
- Set the sweep generator to the frequency range 70 - 1300 MHz.
- Set the signal amplitude to -15 dBm (40 mV_{rms}).
- Typical frequency curves for the types PM 9608, PM 9608B, and PM 9615 are illustrated in figure 77.

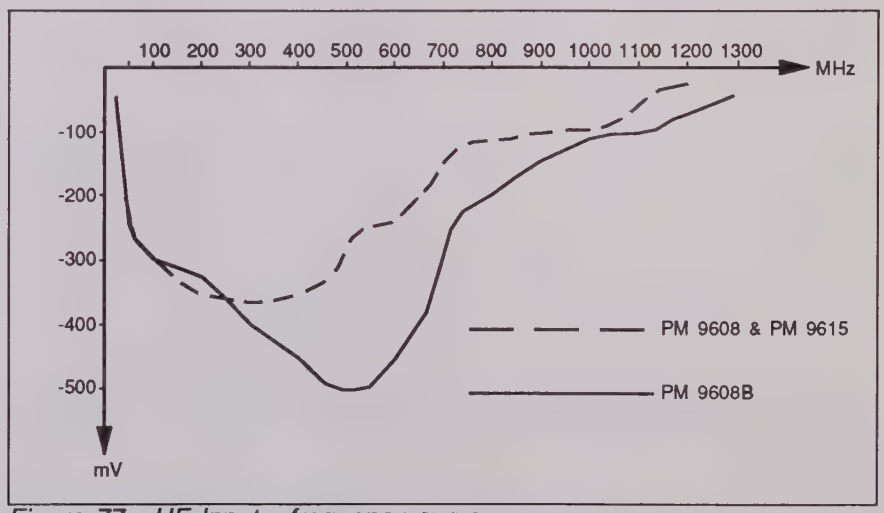

Figure 77. HF Input - frequency curve.

- ***MTCXO Oscillator*** *(option)*

The MTCXO oscillator must be sent to the factory for repair.

- ***Battery Unit*** *(option)*

The battery unit must be installed in a counter during testing.

Required measuring equipment, see page 7.

Fuses

Check fuse VL1. Replace it with a 1.6 A slow blow fuse, if necessary.

If the battery unit still does not work, the PCB-conductor fuse between P2 and the minus pole of C49 may be blown (see figure 78). Replace it with a piece of wire if burnt.

Buzzing relay

The relay buzzes if either thermistor R19 is in contact with the case or if the battery voltage becomes too low (discharged or faulty battery).

+5 V Regulator

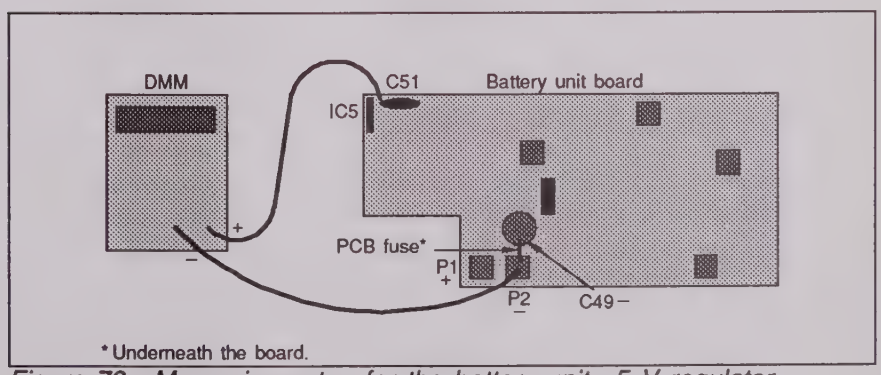

Figure 78. Measuring setup for the battery unit +5 V regulator.

- Disconnect the power cable.
- Connect the DMM and the oscilloscope between the +5 V output (node IC5 pin 2, C51) and ground (P2). See figure 78.
- Switch on the counter.
- The DMM shall display 5 V ±0.2 V.
- The ripple shall not exceed 30 mV_{p-p}. The ripple is generated by the -5 V switching regulator.

Battery ON/OFF Logic

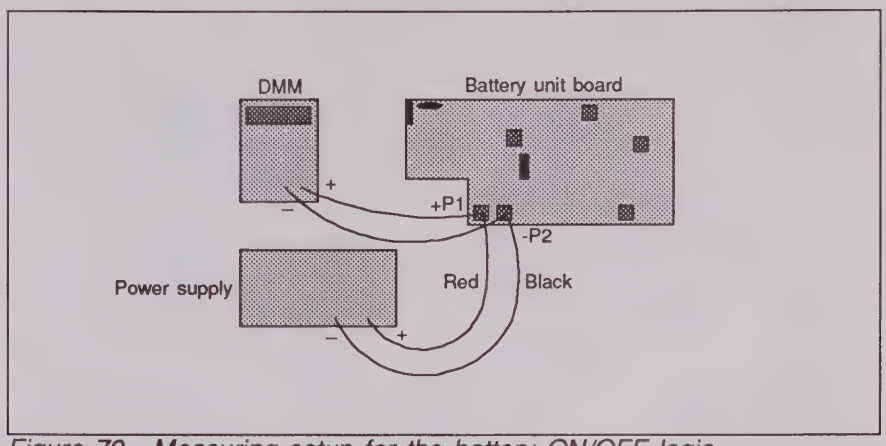

Figure 79. Measuring setup for the battery ON/OFF logic.

- Disconnect the battery from the battery unit.
- Connect the DMM to P1 and P2, see figure 79.
- Connect the power supply between P1 and P2.
- Set the voltage from power supply to 5.3 V.
- Watch the display, and slowly lower the voltage.
- The display shall go out at 5.1 V ±0.1 V.

REPLACEMENT PARTS

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PM 9608B 1.3 GHz HF Input 85
PM 9615 1.0 GHz HF Input 87

PM 6662
Mechanical Parts

POS	SERVICE CODE	DESCRIPTION
	5322 265 30066	Connector, STF74A1
	5322 267 10004	Connector, KC-79-35, to input A
	4822 502 30095	* Screw, RXK B6X08 ST FZB POZ
	4822 502 11152	* Screw, MRX 4X10 ST FZB POZ
	4822 502 10232	* Screw, MRX 4X14 ST FZB POZ
	4822 530 80173	* Spring washer, KBA 3.2 ST FZ DIN137
	4822 530 80173	* Spring washer, KBA 3.2 ST FZ DIN137
	4822 530 80164	* Spring washer, KBA 4.3 ST FZ DIN137
	4822 530 80083	* Lock washer, YT4.3 ST FZ DIN6798A
	5322 502 12003	* Screw, MFXTT 3X08 ST FZ POZ
	5322 502 13265	* Screw, MRXTT 3X06 ST FZ POZ
	4822 502 11473	* Screw, MRXTT 3X08 ST FZ POZ
	4822 502 11473	* Screw, MRXTT 3X08 ST FZ POZ
	4822 505 10326	* Nut, M6M 04 ST FZB
	5322 535 92899	* Distance nut, M3X13
	5322 321 22565	Cable assy, L= 75 to input A
	5322 218 70099	* PC-B assy 1
	5322 218 70102	* PC-B assy 2
	5322 130 90413	Display
	5322 267 70208	Zeebra strip, to disply
	5322 401 11259	* PC-B guide, to HF-Input
	5322 447 91683	* Front part, brown
	5322 462 41115	* Rear foot, beige
	5322 401 11102	Tilting support
	5322 498 10263	Extension bar
	5322 462 41116	Bottom foot
	5322 462 41117	Rubber foot, to bottom foot
	5322 263 50164	* Plug, for bnc-hole, brown
	5322 401 11262	Semi protection
	5322 535 92899	* Distance nut, M3X22.5
	5322 460 60508	Semi protection, to power switch
	5322 381 11049	Window
	5322 492 63808	Spring, to bottom foot
	5322 256 91458	PC-B holder, inside the cover
	5322 456 30063	* Frontplate brown
	5322 456 30064	Logostrip, PM 6662 120 MHz, black
	5322 456 30046	Logostrip, PM 6662 1.0 GHz, black
	5322 456 30051	Logostrip, PM 6662 1.0 GHz, grey
	5322 456 30056	Logostrip, PM 6662 1.3 GHz, black
	5322 456 30061	Logostrip, PM 6662 1.3 GHz, grey
	5322 447 91685	* Cover, beige
	5322 456 30065	* Rear panel, brown
	5322 447 91686	Semi protection
	5322 447 91687	* Shield between input amplifier and counter logic
	5322 255 40945	* Heat sink
	5322 532 52097	* Insulat washer, 3.2X8X1X
	5322 358 50107	* Cable clip, reel, SRB-2.5T-M4
	5322 456 90365	* Earth sign, 8 mm, 3S 6 DIN40011 RT
	5322 466 61813	* Insulat washer, 15X22 CLIP TO220
	5322 456 90366	High voltage, WARNING

PM 6662
Mechanical Parts, cont...

POS	SERVICE CODE	DESCRIPTION
	5322 321 10617*	Mains cable, 1.80 M, SW 432-3X.75MM2-881
	5322 321 10618*	Mains cable, 1.80 M, EU 426U-3X.75MM2-881
	5322 321 10123*	Mains cable, 2.40 M, US 439-3X.82MM2-881
	5322 321 20816*	Mains cable, 2.50 M, GB BS1363/A
C1	5322 122 40444	Capacitor, 1 nF, 20% 250 VAC SDPU RY8
C2	5322 122 40444	Capacitor, 1 nF, 20% 250 VAC SDPU RY8
L1	5322 121 44235	CHOKE, 4 µH, B82131-A5301-M 0.3A
L2	5322 121 44235	CHOKE, 4 µH, B82131-A5301-M 0.3A
T1	5322 148 80881	Transformer EI48

PM 6662
Basic Board, U1

POS	SERVICE CODE	DESCRIPTION
BU101	5322 265 40379	Connector, 5 Pol, 22-05-1059 3094-05F
BU102	5322 265 40634	Connector, 12 Pol, 76382-312
BU103	5322 265 64028	Connector, 1 Pol, 22-03-2101 4030-10A
BU104	5322 265 64028	Connector, 1 Pol, 22-03-2101 4030-10A
BU105	5322 265 40687	Connector, 1 Pol, low profile header
BU197	5322 268 14141	Contact pin, minicoax for PC-B
BU197	5322 268 24116	Bushing, minicoax for PC-B
C101	4822 121 41677	Capacitor, 1 nF, 10% 400V 4X10.5 3M
C102	5322 122 32287	Capacitor, 4.70 pF, 5% 50V NP0 0805
C103	5322 122 32481	Capacitor, 15 pF, 5% 50V NP0 0805
C104	4822 122 33575	Capacitor, 22 pF, 5% 50V NP0 0805
C105	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C106	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C107	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C108	5322 124 10455	Capacitor, 68 µF, 20% 6.3V SOLID AL
C110	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C111	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C112	5322 124 10684	Capacitor, 15 µF, 20%6.3V 6.0X3.2 MOLD
C113	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C116	5322 124 10684	Capacitor, 15 µF, 20%6.3V 6.0X3.2 MOLD
C117	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C118	5322 124 10684	Capacitor, 15 µF, 20%6.3V 6.0X3.2 MOLD
C119	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C120	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C121	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C122	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C123	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 MOLD
C124	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C125	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C126	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C127	5322 124 41367	Capacitor, 680 µF, 20% 16V ECEA1CU682
C128	5322 122 32481	Capacitor, 15 pF, 5% 50V NP0 0805
C129	5322 124 10686	Capacitor, 1 µF, 20% 16V 3.2X1.6 MOLD
C131	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 MOLD
C133	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805

PM 6662
Basic Board, U1, cont...

POS	SERVICE CODE	DESCRIPTION
C134	4822 122 33515	Capacitor, 82 pF, 5% 50V NP0 0805
C135	5322 125 54029	Capacitor, 18 pF, 2-18PF 300V
C136	5322 122 32658	Capacitor, 22 pF, 5% 50V NP0 0805
C137	4822 122 33515	Capacitor, 82 pF, 5% 50V NP0 0805
C139	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C140	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C171	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C172	5322 122 32287	Capacitor, 4.70 pF, 5% 50V NP0 0805
C173	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C174	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
C175	5322 122 32481	Capacitor, 15 pF, 5% 50V NP0 0805
C176	5322 124 10684	Capacitor, 15 µF, 20%6.3V 6.0X3.2 MOLD
C177	4822 122 31414	Capacitor, 12 pF, 5% 50V NP0 0805
GR101	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR103	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR104	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR105	4822 130 31878	Diode, 1 A, 1N4003/200 DO-41
GR106	4822 130 31878	Diode, 1 A, 1N4003/200 DO-41
GR109	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR111	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR112	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR113	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
IC101	5322 209 84825	IC, MC10216P
IC104	5322 209 71559	LSI, OQ0501
IC104	5322 255 40421	IC-socket, 24 Pol, DIL
IC105	5322 209 51669	IC-microp,65,69 MAB8461
IC105	5322 255 40234	IC-socket, 28 Pol, DIL
IC106	5322 209 84825	IC, MC10216P
IC109	5322 209 86203	IC, MC10138P
IC110	5322 209 71555	IC, PC74HC373T SO-20
IC112	5322 401 11257	Clamp, TO220
IC112	5322 209 84841	IC, 5 V, MC7805CT 1A TO-220
JP101	5322 265 60251	Connector, 4 Pol, F095 double row
JP101	5322 269 50099	Connector, 2 Pol, F095 jumper
KT101	5322 242 74163	Crystal, 1 MHz, HC-49U
L101	5322 158 10052	HF choke, 3B ZMAX>0.6 kΩ
R101	5322 116 54984	Resistor, 68 Ω, 5% 1.6 W PR37
R102	5322 111 91141	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R103	5322 111 91141	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R104	5322 116 80447	Resistor, 47 kΩ, 1% 1/8 W 100PPM 1206
R105	5322 116 80429	Resistor, 10 kΩ, 1% 1/8 W 100PPM 1206
R106	5322 116 80428	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R107	5322 111 90094	Resistor, 1 MΩ, 1% 1/8 W 100PPM 1206
R108	5322 111 91141	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R109	5322 111 91141	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R110	5322 111 91141	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R111	5322 111 91141	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R112	5322 116 80426	Resistor, 10 Ω, 1% 1/8 W 100PPM 1206
R113	5322 116 80427	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R114	4822 111 90339	Resistor, 12 Ω, 1% 1/8 W 100PPM 1206

PM 6662
Basic Board, U1, cont...

POS	SERVICE CODE	DESCRIPTION
R115	4822 111 90203	Resistor, 68 Ω, 1% 1/8 W 100PPM 1206
R116	5322 116 80448	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R117	5322 100 11143	Potentiometer, 1 kΩ, 25% 0.1 W 3304X-1-103
R117	5322 414 30044	Knob, 1 mm, brown SP=4 no line
R117	5322 414 70016	Cover, 8 mm, brown wh.Line
R118	5322 116 80427	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R119	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R120	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R121	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R122	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R123	5322 116 80438	Resistor, 33 Ω, 1% 1/8 W 100PPM 1206
R124	5322 111 90242	Resistor, 18 Ω, 1% 1/8 W 100PPM 1206
R125	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R126	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R127	5322 116 80438	Resistor, 33 Ω, 1% 1/8 W 100PPM 1206
R128	5322 116 80438	Resistor, 33 Ω, 1% 1/8 W 100PPM 1206
R129	5322 111 90242	Resistor, 18 Ω, 1% 1/8 W 100PPM 1206
R130	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R131	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R133	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R135	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R137	5322 111 90094	Resistor, 1 MΩ, 1% 1/8 W 100PPM 1206
R138	5322 111 90113	Resistor, 56 Ω, 1% 1/8 W 100PPM 1206
R146	5322 116 80449	Resistor, 68 Ω, 1% 1/8 W 100PPM 1206
R147	5322 116 80432	Resistor, 1.50 kΩ, 1% 1/8 W 100PPM 1206
R148	5322 116 80432	Resistor, 1.50 kΩ, 1% 1/8 W 100PPM 1206
R149	5322 116 80428	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R151	5322 116 80447	Resistor, 47 kΩ, 1% 1/8 W 100PPM 1206
R153	5322 116 80447	Resistor, 47 kΩ, 1% 1/8 W 100PPM 1206
R154	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8 W 100PPM 1206
R155	5322 116 80447	Resistor, 47 kΩ, 1% 1/8 W 100PPM 1206
R157	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R158	5322 116 80444	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R159	4822 111 90239	Resistor, 56 Ω, 1% 1/8 W 100PPM 1206
R160	5322 116 80429	Resistor, 10 kΩ, 1% 1/8 W 100PPM 1206
R161	5322 116 80433	Resistor, 22 Ω, 1% 1/8 W 100PPM 1206
SK101	5322 277 21124	Voltage switch, V202-12-MA-08-Q
SK102	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK102	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK103	5322 276 11447	Push switch, 1 cell
SK103	5322 414 20033	Push button, schad, 6X10 M-BR 30304 ALPS
SK104	5322 273 30387	Rotary switch
TP102	5322 265 60251	Connector, 4 Pol, F095 double row
TS101	5322 130 44787	Transistor, BFR31 .01A 25V SOT23
TS102	5322 130 40781	Transistor, BFS17 .05A 15V SOT23
TS103	5322 130 60508	Transistor, BC857B .1A45V SOT23

PM 6662
Front Panel, U2

POS	SERVICE CODE	DESCRIPTION
BU201	5322 267 50336	Connector, 1 Pol, 22-14-2104 4455-BC
C201	5322 122 34123	Capacitor, 10 nF, 20% 50V X7R 0805
GR201	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR203	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR204	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
IC201	5322 209 11129	IC, PCF8576T VSO56
R201	5322 116 80429	Resistor, 10 kΩ, 1% 1/8 W 100PPM 1206
SK201	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK201	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK202	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK202	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK203	5322 414 60146	Push button, VKS, 6.5X6.5 BEIGE 40317
SK203	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK204	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK204	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK205	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK205	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS

PM 6669
Mechanical Parts

POS	SERVICECODE	DESCRIPTION
	5322 268 10275*	Receptacle, 140825-2 2.8X0.8
	5322 267 10004	Connector, KC-79-35, to input A
	5322 121 42352	Mains filter, 1 A, FN326-1/07
	4822 502 30095*	Screw, RXK B6X08 ST FZB POZ
	4822 502 11152*	Screw, MRX 4X10 ST FZB POZ
	4822 502 10232*	Screw, MRX 4X14 ST FZB POZ
	4822 530 80173*	Spring washer, KBA 3.2 ST FZ DIN137
	4822 530 80173*	Spring washer, KBA 3.2 ST FZ DIN137
	4822 530 80164*	Spring washer, KBA 4.3 ST FZ DIN137
	4822 530 80083*	Lock washer, YT4.3 ST FZ DIN6798A
	5322 502 12003*	Screw, MFXTT 3X08 ST FZ POZ
	4822 502 11835*	Screw, MRXTT 3X06 ST FZ POZ
	4822 502 11835*	Screw, MRXTT 3X06 ST FZ POZ
	4822 502 11473*	Screw, MRXTT 3X08 ST FZ POZ
	4822 505 10326*	Nut, M6M 04 ST FZB
	5322 321 22565	Cable assy, to input A
	5322 218 70101*	PC-B assy 1
	5322 218 70103*	PC-B assy 2
	5322 130 90413	Display
	5322 267 70208	Zeebra strip, to display
	5322 401 11259*	PC-B guide, to Oscillator and HF-Input
	5322 447 91683*	Front part, brown
	5322 447 91443*	Cover, Beige
	5233 218 70106	PC-B support, inside the cover
	5322 462 41115*	Rear foot, beige
	5322 401 11102	Tilting assembly
	5322 447 91688*	Rear panel, brown
	5322 255 40946*	Heat sink, to IC 106 & 107
	5322 447 91684*	Front plate, brown
	5322 498 10263	Extension bar
	5322 456 30062	Logostrip, PM 6669 120 MHz, black
	5322 456 30045	Logostrip, PM 6669 1.0 MHz, black
	5322 456 30049	Logostrip, PM 6669 1.0 MHz, grey
	5322 456 30055	Logostrip, PM 6669 1.3 MHz, black
	5322 456 30059	Logostrip, PM 6669 1.3 MHz, grey
	5322 462 41116	Bottom foot
	5322 462 41117	Rubber foot, to bottom foot
	5322 447 91681*	Shield between input amplifier and counter logic
	5322 401 11261*	Bracket
	5322 263 50164*	Plug, for BNC-hole
	5322 401 11262	Semi protection
	5322 447 91682*	Shield, to input amplifier
	5322 535 92899*	Distance nut, M3X22.5
	5322 447 91692	Semi protection, Sold side
	5322 460 60508	Semi protection, to voltage switch
	5322 381 11049	Window
	5322 492 63808	Spring, to bottom foot
	5322 532 52097*	Insulat Washer, 3.2X8X1X
	5322 358 50107*	Cable clip, reel, SRB-2.5T-M4
	5322 456 90365*	Earth sign, 8 MM, 3S 6 DIN40011 RT

PM 6669
Mechanical Parts, cont...

POS	SERVICE CODE	DESCRIPTION
	5322 321 40117	Protect sleeve, 2.80 MM, N 94610
	5322 456 90366	High voltage, WARNING
	5322 321 10617*	Mains cable, 1.80 M, SW 432-3X.75MM2-881
	5322 321 10618*	Mains cable, 1.80 M, EU 426U-3X.75MM2-881
	5322 321 10123*	Mains cable, 2.40 M, US 439-3X.82MM2-881
	5322 321 20816*	Mains cable, 2.50 M, GB BS1363/A

PM 6669
Basic Board, U1

POS	SERVICE CODE	DESCRIPTION
BU101	5322 265 40379	Connector, 5 Pol, 22-05-1059 3094-05F
BU102	5322 265 40634	Connector, 12 Pol, 76382-312
BU103	5322 265 64028	Connector, 10 Pol, 22-03-2101 4030-10A
BU104	5322 265 64028	Connector, 10 Pol, 22-03-2101 4030-10A
BU105	5322 265 40687	Connector, 10 Pol, LOW PROFILE HEADER
BU105	5322 265 40197	Connector, 10 Pol, F095 DOUBLE ROW
BU197	5322 268 14141	Contact pin, minicoax for PC-B
BU197	5322 268 24116	Bushing, minicoax for PC-B
C101	5322 121 40308	Capacitor, 22 nF, 10% 400V
C102	5322 122 32549	Capacitor, 3.30 pF, +-0.25pF 500V NP0 2M
C103	5322 122 32269	Capacitor, 68 pF, 5% 50V NP0 0805
C104	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 Mold
C105	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C106	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C107	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C108	5322 122 33062	Capacitor, 270 pF, 10% 500V 2M
C109	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C110	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C111	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C112	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C113	5322 124 10455	Capacitor, 68 µF, 20% 6.3V SPolID AL
C114	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C115	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C116	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C118	5322 124 10684	Capacitor, 15 µF, 20%6.3V 6.0X3.2 Mold
C119	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C120	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C121	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C122	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C123	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 Mold

PM 6669
Basic Board, U1, cont...

POS	SERVICE CODE	DESCRIPTION
C126	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C127	5322 124 41367	Capacitor, 6800 µF, 20% 16V ECEA1CU682
C128	5322 124 41366	Capacitor, 2200 µF, 20% 16V ECEA1CU222
C129	5322 124 10686	Capacitor, 1 µF, 20% 16V 3.2X1.6 Mold
C130	5322 124 10686	Capacitor, 1 µF, 20% 16V 3.2X1.6 Mold
C131	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 Mold
C132	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 Mold
C133	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C134	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C135	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C136	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C137	5322 122 32448	Capacitor, 10 pF, 5% 50V NP0 0805
C138	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R 1206
C139	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C140	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C141	5322 122 32447	Capacitor, 1 pF, 5% 50V NP0 0805
C171	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
GR101	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR103	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR109	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR111	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR112	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR114	4822 130 32003	Bridge rectifier, 4 A, KBL02 200V
IC101	5322 209 71556	IC, SP9680 DIL-8
IC102	5322 209 86203	IC, MC10138P
IC103	5322 209 70313	IC, MC10125P
IC104	5322 209 71559	LSI, OQ0501
IC104	5322 255 40421	IC-socket, 24 Pol, DIL
IC105	5322 209 51241	IC-microp, PM6665,69 MAB8461
IC105	5322 255 40234	IC-socket, 28 Pol, DIL
IC106	5322 401 11257	Clamp, TO220
IC106	5322 466 61813	Insulat washer, 15X22 CLIP TO220
IC106	5322 209 84841	IC, 5 V, MC7805CT 1A TO-220
IC107	5322 492 70235	Spring,
IC107	5322 466 61813	Insulat washer, 15X22 CLIP TO220
IC107	5322 130 44843	IC, -5 V, MC7905CT 1A TO-220
IC110	5322 209 71555	IC, PC74HC373T SO-20
JP101	5322 265 60251	Connector, 4 Pol, F095 DOUBLE ROW
JP101	5322 269 50099	Connector, 2 Pol, F095 JUMPER
L101	5322 158 10243	Choke, 100 µH, 10% Q=50 1641-104
P1	5322 290 34064	Flat pin, 2.80 MM, E184/8 LESA SN BAND
P2	5322 290 34064	Flat pin, 2.80 MM, E184/8 LESA SN BAND
R101	5322 111 90094	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R102	5322 111 90094	Resistor, 10 MΩ, 10% 1/4 W RC-01 1206
R103	4822 111 90169	Resistor, 560 kΩ, 5% 1/4 W RC-01 1206
R104	4822 111 90169	Resistor, 560 kΩ, 5% 1/4 W RC-01 1206
R105	4822 111 90573	Resistor, 56 kΩ, 5% 1/4 W RC-01 1206
R106	5322 116 80429	Resistor, 100 kΩ, 1% 1/8 W 100PPM 1206
R107	4822 111 90203	Resistor, 68 Ω, 1% 1/8 W 100PPM 1206
R108	4822 111 90203	Resistor, 68 Ω, 1% 1/8 W 100PPM 1206

PM 6669
Basic Board, U1, cont...

POS	SERVICE CODE	DESCRIPTION
R109	5322 116 80429	Resistor, 100 kΩ, 1% 1/8 W 100PPM 1206
R110	5322 116 80428	Resistor, 10 kΩ, 1% 1/8 W 100PPM 1206
R111	5322 116 80428	Resistor, 10 kΩ, 1% 1/8 W 100PPM 1206
R112	5322 116 80438	Resistor, 330 Ω, 1% 1/8 W 100PPM 1206
R113	5322 116 80438	Resistor, 330 Ω, 1% 1/8 W 100PPM 1206
R114	4822 111 90203	Resistor, 68 Ω, 1% 1/8 W 100PPM 1206
R115	4822 111 90203	Resistor, 68 Ω, 1% 1/8 W 100PPM 1206
R116	5322 414 30044	Knob, 10 MM, Brown SP=4 no line
R116	5322 414 70016	Cover, 8 MM, Brown wh. line
R116	5322 101 20942	Potentiometer, 500 Ω
R117	4822 111 90344	Resistor, 15 Ω, 1% 1/8 W 100PPM 1206
R118	5322 100 11143	Potentiometer, 10 kΩ, 25% 0.1W 3304X-1-103
R119	5322 116 80436	Resistor, 220 kΩ, 1% 1/8 W 100PPM 1206
R120	5322 116 80427	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R121	4822 111 90357	Resistor, 33 Ω, 1% 1/8 W 100PPM 1206
R122	5322 111 90118	Resistor, 8.20 kΩ, 1% 1/8 W 100PPM 1206
R123	5322 116 80448	Resistor, 47 Ω, 1% 1/8 W 100PPM 1206
R124	5322 116 80444	Resistor, 470 Ω, 1% 1/8 W 100PPM 1206
R125	5322 111 90118	Resistor, 8.20 kΩ, 1% 1/8 W 100PPM 1206
R126	5322 116 80427	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R127	5322 111 90118	Resistor, 8.20 kΩ, 1% 1/8 W 100PPM 1206
R128	5322 111 90118	Resistor, 8.20 kΩ, 1% 1/8 W 100PPM 1206
R129	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8 W 100PPM 1206
R130	5322 116 80438	Resistor, 330 Ω, 1% 1/8 W 100PPM 1206
R131	5322 116 80438	Resistor, 330 Ω, 1% 1/8 W 100PPM 1206
R132	5322 116 80427	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R133	5322 116 80427	Resistor, 1 kΩ, 1% 1/8 W 100PPM 1206
R134	5322 116 80444	Resistor, 470 Ω, 1% 1/8 W 100PPM 1206
R135	5322 116 80444	Resistor, 470 Ω, 1% 1/8 W 100PPM 1206
R146	5322 116 80449	Resistor, 680 Ω, 1% 1/8 W 100PPM 1206
R147	5322 116 80432	Resistor, 1.50 kΩ, 1% 1/8 W 100PPM 1206
R148	5322 116 80432	Resistor, 1.50 kΩ, 1% 1/8 W 100PPM 1206
R149	5322 116 80428	Resistor, 10 kΩ, 1% 1/8 W 100PPM 1206
R151	5322 116 80447	Resistor, 470 kΩ, 1% 1/8 W 100PPM 1206
R152	5322 116 80447	Resistor, 470 kΩ, 1% 1/8 W 100PPM 1206
R153	5322 116 80447	Resistor, 470 kΩ, 1% 1/8 W 100PPM 1206
R154	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8 W 100PPM 1206
SK102	5322 414 20033	Push button, SCHAD, 6X10 M-BR 30304 ALPS
SK102	5322 276 11447	Push switch, 1 CELL, PM6673-77
SK103	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK103	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK104	5322 277 21124	Voltage switch, V202-12-MA-08-Q
SK106	5322 414 20033	Push button, SCHAD, 6X10 M-BR 30304 ALPS
SK106	5322 276 12192	Push switch, 1 CELL,
TP102	5322 265 60251	Connector, 4 Pol, F095 DOUBLE ROW
TR101	5322 146 21229	Transformer,
TS101	5322 130 44343	Transistor, BFR30 .01A 25V SOT23
TS102	5322 130 40781	Transistor, BFS17 .05A 15V SOT23

PM 6669
Front Panel, U2

POS	SERVICE CODE	DESCRIPTION
BU201	5322 267 50336	Connector, 10 Pol, 22-14-2104 4455-BC
C201	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
GR201	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR203	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR204	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
GR206	5322 130 30691	Diode, 0.25 A, BAW56 70V SOT23
IC201	5322 209 11129	IC, PCF8576T VSO56
R201	5322 116 80429	Resistor, 100 kΩ, 1% 1/8 W 100PPM 1206
SK201	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK201	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK202	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK202	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK203	5322 414 60146	Push button, VKS, 6.5X6.5 BEIGE 40317
SK203	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK204	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK204	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK205	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK205	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS
SK206	5322 414 20031	Push button, VKS, 6.5X6.5 L-BR 30304
SK206	4822 276 11076	Key switch, 1 Pol, DW-5112 TYPE VKS

PM 6669
Crystal Oscillator, U4

POS	SERVICE CODE	DESCRIPTION
BU404	5322 267 54195	Connector, 10 pol, 22-15-2106 4455-AC
C401	4822 122 31414	Capacitor, 10 nF, -20/+50% 100 V 2M
C402	4822 122 31237	Capacitor, 82 pF, 2% 100 V NPO 2M
C403	5322 125 54029	Capacitor, 2-18 pF, 300 V
C404	4822 122 31063	Capacitor, 22 pF, 2% 100 V NPO 2M
C405	4822 122 31237	Capacitor, 82 pF, 2% 100 V NPO 2M
IC401	5322 209 11455	IC, MM74HCU04N
KT401	5322 242 74163	Crystal, 10 MHz, HC-49U
R401	5322 116 55535	Resistor, 1 MΩ, 1% 0.4 WMR25
R402	5322 116 55274	Resistor, 215 Ω, 1% 0.4 W MR25
R403	4822 116 53108	Resistor, 1 kΩ, 1% 0.5 W MRS25
R404	4822 116 53022	Resistor, 10 kΩ, 1% 0.5 W MRS25

*No stock item

PM 9604
GPIB Interface

POS	SERVICE CODE	DESCRIPTION
	4822 530 80173*	Spring washer, KBA 3.2 ST FZ DIN137
	4822 530 80082*	Lock washer, YT3.2 ST FZ DIN6798A
	4822 502 11474*	Screw, MRXTT 3X10 ST FZ POZ
	4822 502 11473*	Screw, MRXTT 3X8 ST FZ POZ
	5322 535 92884*	Spacer, 19.10 mm, KGLS-12S
	5322 401 11252*	Bracket
	5322 401 11257*	Clamp, TO220
	5322 466 61813*	Insulating washer, 15X22 CLIP TO220
BU101	5322 267 60148	Connector, 24 pol, 57LE-20240-77OOD35G
BU102	5322 321 22315	Cable assy, 130 mm, 10-pol
C1	5322 124 14075	Capacitor, 1 µF, 20% 40V (25V) SOL AL
C2	5322 121 42525	Capacitor, 470 nF, 10% 63V MMKO-5 PETP
C3	5322 121 42525	Capacitor, 470 nF, 10% 63V MMKO-5 PETP
C4	4822 122 31414	Capacitor, 10 nF, -20/+50% 100V 2M
C5	4822 122 31414	Capacitor, 10 nF, -20/+50% 100V 2M
C6	4822 122 31414	Capacitor, 10 nF, -20/+50% 100V 2M
GR1	4822 130 30621	Diode, 0.20 A, 1N4148/75 DO-35
IC1	5322 255 40233	IC-socket, 40 pol, DIL
IC1	5322 209 81264	IC, P8291A TALK/LISTEN
IC2	5322 209 51434	IC-microp, PM9604 MAB8461
IC2	5322 255 40234	IC-socket, 28 pol, DIL
IC3	5322 209 81842	IC, SN75161AN
IC4	5322 209 81807	IC, SN75160AN
IC5	4822 209 10317	IC, HEF40097BP
IC6	5322 209 84841	IC, 5 V, MC7805CT 1A TO-220
R1	5322 111 94031	Res.Network, 47 kΩ, 10%X6 1/8W
R8	5322 116 53232	Resistor, 464 Ω, 1% 1/2W MRS25
SW1	5322 277 21125	DIP Switch, 6 pol, 206-6 RAST
TS1	4822 130 40824	Transistor, BD136 1.5A 45V TO126

PM 9605
Battery Unit

POS	SERVICE CODE	DESCRIPTION
	4822 530 80173*	Spring washer, KBA 3.2 ST FZ DIN137
	4822 502 11835*	Screw, MRXTT 3X6 ST FZ POZ
	4822 502 11474*	Screw, MRXTT 3X10 ST FZ POZ
	4822 502 11473*	Screw, MRXTT 3X8 ST FZ POZ
	5322 321 22315	Cable assy, 130 mm, 10-pol
	5322 218 70098*	PC-B assy
	5322 321 23322	Cable set
	5322 447 91679*	Holder
	5322 401 11253*	Bracket
	5322 401 11254*	Clamp
	5322 535 92885*	Distance nut
	5322 401 11255*	Clamp washer
	5322 466 61812*	Insulating washer
C10	5322 124 10687	Capacitor, 6.80 µF, 20% 16V 6.0X3.2 MOLD
C11	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R0805
C20	5322 124 10686	Capacitor, 1 µF, 20% 16V 3.2X1.6 MOLD
C21	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R1206
C30	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R0805
C31	5322 124 10686	Capacitor, 1 µF, 20% 16V 3.2X1.6 MOLD
C32	5322 124 10685	Capacitor, 2.20 µF, 20%6.3V 3.2X1.6 MOLD
C41	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R0805
C42	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R0805
C45	4822 124 40963	Capacitor, 33 µF, 20% 10VSOLID AL
C46	4822 124 40729	Capacitor, 2200 µF, 20% 6.3V RADIAL 2M
C47	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R1206
C48	4822 122 33496	Capacitor, 100 nF, 10% 63V X7R1206
C49	4822 124 40963	Capacitor, 33 µF, 20% 10VSOLID AL
C50	4822 124 40963	Capacitor, 33 µF, 20% 10VSOLID AL
C51	5322 124 10455	Capacitor, 68 µF, 20% 6.3VSOLID AL
C52	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R0805
GR1	4822 130 31982	Diode, 2 A, BYV27-100
GR13	5322 130 33671	Diode, 0.35 W, BZX84-C6V2SOT23
GR2	5322 130 80214	Diode, 0.25 A, BAS2875VSOT143
GR3	5322 130 80214	Diode, 0.25 A, BAS2875VSOT143
GR4	5322 130 80214	Diode, 0.25 A, BAS2875VSOT143
GR7	4822 130 31982	Diode, 2 A, BYV27-100
GR9	5322 130 80214	Diode, 0.25 A, BAS2875VSOT143
IC1	5322 209 86513	IC, UA78S40PC
IC2	5322 209 71553	IC, NE532D DUALSO-8
IC3	5322 209 71553	IC, NE532D DUALSO-8
IC4	4822 209 81397	IC, TL431C-LPTO92
IC5	5322 209 72487	IC, 5 V, LM2940CT-5.0TO-220
L1	5322 157 53239	Choke
L2	5322 158 10311	Choke, 1 µH, 10% Q=44 1641-102
L3	5322 158 10311	Choke, 1 µH, 10% Q=44 1641-102
P1	5322 290 34064	Flat pin, 2.80 mm, E184/8 LESA SNBAND
P2	5322 290 34064	Flat pin, 2.80 mm, E184/8 LESA SNBAND
PT1	5322 100 11143	Potentiometer, 10 kΩ, 25% 0.1W 3304X-1-103
PT2	5322 100 11144	Potentiometer, 500 Ω, 25% 0.1W Cermet
PT3	5322 100 11143	Potentiometer, 10 kΩ, 25% 0.1W 3304X-1-103

PM 9605
Battery Unit, cont...

POS	SERVICE CODE	DESCRIPTION
PT4	5322 100 11144	Potentiometer, 500 Ω, 25% 0.1W Cermet
R1	5322 116 53071	Resistor, 0.22 Ω, SN14L2EJ 0.22 Ω 5%
R10	5322 116 80427	Resistor, 1 kΩ, 1% 1/8W 100 ppm 1206
R12	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
R13	5322 116 80443	Resistor, 3.90 kΩ, 1% 1/8W 100 ppm 1206
R14	5322 116 80435	Resistor, 22 kΩ, 1% 1/8W 100 ppm 1206
R15	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
R19	5322 116 30239	Thermistor, 4.70 kΩ, 5% 1/2W NTC
R2	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R20	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R23	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R24	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R25	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R27	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R3	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R30	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
R31	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R33	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R34	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R36	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R37	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R4	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R40	5322 116 53071	Resistor, 0.22 Ω, SN14L2EJ 0.22 Ω 5%
R41	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
R42	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R43	5322 116 80427	Resistor, 1 kΩ, 1% 1/8W 100 ppm 1206
R45	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R47	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R48	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R5	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R50	5322 116 80433	Resistor, 220 Ω, 1% 1/8W 100 ppm 1206
R52	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R6	5322 116 80431	Resistor, 150 Ω, 1% 1/8W 100 ppm 1206
R7	5322 116 80427	Resistor, 1 kΩ, 1% 1/8W 100 ppm 1206
R9	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
RE1	5322 280 70332	Relay, 5 V, SY-5K1-pol VXL
RE2	5322 280 70332	Relay, 5 V, SY-5K1-pol VXL
TS1	5322 130 44324	Transistor, BD204 8A 60V TO220
TS2	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23
TS4	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23
TS5	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS6	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS7	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS9	5322 130 40753	Transistor, BD132 6A 45V TO126
VL1	4822 253 30024	Fuse, 1.60 A, 5X20 T nFST034.3119
VL1	5322 256 30401	Fuse holder, UHB 031.5101 5X20MM

PM 9608
1.1 GHz HF Input

POS	SERVICE CODE	DESCRIPTION
	5322 321 22313	Cable assy
	5322 447 91672*	Shield
	5322 447 91673*	Shield cover
BU301	5322 267 60199	Connector, R 114426 SMB
BU302	5322 290 30191	Soldering pin, 2.80 mm, E242.5 SN
BU303	5322 267 54195	Connector, 10 pol, 22-15-2106 4455-AC
BU304	5322 290 30191	Soldering pin, 2.80 mm, E242.5 SN
C301	5322 122 32531	Capacitor, 100 pF, 5% 50V NP0 0805
C302	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C303	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C304	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C305	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C306	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C307	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C308	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C310	5322 122 32287	Capacitor, 4.70 pF, 5% 50V NP0 0805
C311	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C312	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C313	5322 122 32448	Capacitor, 10 pF, 5% 50V NP0 0805
C314	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C316	5322 122 33063	Capacitor, 2.20 pF, 5% 50V NP0 0805
C317	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C318	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C319	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C320	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C321	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C322	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C323	5322 122 32446	Capacitor, 470 nF, 20% 50V X7R 2220
C324	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C325	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C326	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C327	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
GR303	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR304	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR305	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR306	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR307	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR308	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR309	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR311	5322 130 80246	Diode, BAR 16-1 SOT23
GR313	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
IC301	5322 209 71557	IC, UPC1652G SO-8
IC302	5322 209 60756	IC, SAB1256P /256 DIL-8, Selected
IC303	5322 209 71553	IC, NE532D DUAL SO-8
L301	5322 157 52689	Choke, 0.10 µH, 10% MLnF3216DR10K
L307	5322 157 52689	Choke, 0.10 µH, 10% MLnF3216DR10K
R301	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R302	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R303	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R304	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206

PM 9608

1.1 GHz HF Input, cont...

POS	SERVICE CODE	DESCRIPTION
R305	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R306	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R307	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R308	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R309	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R310	4822 111 90154	Resistor, 270 Ω, 1% 1/8W 100 ppm 1206
R311	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R312	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R313	4822 111 90397	Resistor, 8.20 Ω, 10% 1/4W RC-01 1206
R314	5322 116 80431	Resistor, 150 Ω, 1% 1/8W 100 ppm 1206
R315	4822 111 90397	Resistor, 8.20 Ω, 10% 1/4W RC-01 1206
R316	5322 116 80433	Resistor, 220 Ω, 1% 1/8W 100 ppm 1206
R319	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R320	5322 111 90095	Resistor, 10 Ω, 1% 1/8W 100 ppm 1206
R321	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R322	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R324	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R325	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R326	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R327	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R328	4822 111 90154	Resistor, 270 Ω, 1% 1/8W 100 ppm 1206
R329	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R330	5322 101 14299	Potentiometer, 1 kΩ, 10% 72X
R331	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R332	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R333	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R335	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R336	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R337	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R338	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R339	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R340	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R341	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R342	5322 116 80427	Resistor, 1 kΩ, 1% 1/8W 100 ppm 1206
R343	5322 111 90113	Resistor, 560 Ω, 1% 1/8W 100 ppm 1206
R344	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R345	5322 111 90376	Resistor, 4.70 Ω, 10% 1/4W RC-01 1206
R347	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R348	4822 111 90339	Resistor, 120 Ω, 1% 1/8W 100 ppm 1206
R349	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R350	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R351	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R352	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R353	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
R354	5322 111 90376	Resistor, 4.70 Ω, 10% 1/4W RC-01 1206
TS301	5322 130 42567	Transistor, BFQ67 SOT23
TS302	5322 130 42567	Transistor, BFQ67 SOT23
TS303	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS304	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS305	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23
TS306	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23

PM 9608B
1.3 GHz HF Input

POS	SERVICE CODE	DESCRIPTION
	5322 321 22313	Cable assy
	5322 447 91672*	Shield
	5322 447 91673*	Shield cover
	5322 401 11256*	Cable clip
BU301	5322 267 60199	Connector, R 114426 SMB
BU302	5322 290 34064	Flat pin, 2.80 mm, E184/8 LESA SN BAND
BU303	5322 267 54195	Connector, 10 pol, 22-15-2106 4455-AC
BU304	5322 290 34064	Flat pin, 2.80 mm, E184/8 LESA SN BAND
C301	5322 122 32532	Capacitor, 100 pF, 5% 50V NP0 0805
C302	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C303	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C304	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C305	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C306	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C307	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C308	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C310	5322 122 32287	Capacitor, 4.70 pF, 5% 50V NP0 0805
C311	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C312	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C313	5322 122 32481	Capacitor, 15 pF, 5% 50V NP0 0805
C314	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C316	5322 122 32447	Capacitor, 1 pF, 5% 50V NP0 0805
C317	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C318	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C319	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C320	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C321	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C322	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C323	5322 122 32446	Capacitor, 470 nF, 20% 50V X7R 2220
C324	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C325	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C326	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C327	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C331	5322 122 32447	Capacitor, 1 pF, 5% 50V NP0 0805
C332	5322 122 32449	Capacitor, 3.3 pF, 5% 50V NP0 0805
C334	5322 122 32449	Capacitor, 3.30 pF, 5% 50V NP0 0805
C335	5322 122 32658	Capacitor, 22 pF, 5% 50V NP0 0805
GR303	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR304	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR305	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR306	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR307	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR308	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR309	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR311	5322 130 80246	Diode, BAR 16-1 SOT23
GR313	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR315	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
IC301	5322 209 71557	IC, UPC1652G SO-8 VAR
IC302	5322 209 61399	IC, U833BS DIL8
IC303	5322 209 71553	IC, NE532D DUAL SO-8

PM 9608B
1.3 GHz HF Input, cont...

POS	SERVICE CODE	DESCRIPTION
L301	5322 157 52689	Choke, 0.10 µH, 10% MLnF3216DR10K
L307	5322 157 52689	Choke, 0.10 µH, 10% MLnF3216DR10K
R301	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R302	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R303	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R304	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R305	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R306	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R307	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R308	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R309	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R310	4822 111 90154	Resistor, 270 Ω, 1% 1/8W 100 ppm 1206
R311	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R312	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R313	4822 111 90397	Resistor, 8.20 Ω, 10% 1/4W RC-01 1206
R314	5322 116 80431	Resistor, 150 Ω, 1% 1/8W 100 ppm 1206
R315	4822 111 90397	Resistor, 8.20 Ω, 10% 1/4W RC-01 1206
R316	5322 116 80433	Resistor, 220 Ω, 1% 1/8W 100 ppm 1206
R319	4822 111 90357	Resistor, 33 Ω, 1% 1/8W 100 ppm 1206
R320	5322 111 90095	Resistor, 10 Ω, 1% 1/8W 100 ppm 1206
R321	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R322	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R324	5322 111 90242	Resistor, 180 Ω, 1% 1/8W 100 ppm 1206
R325	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R326	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R327	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R328	4822 111 90154	Resistor, 270 Ω, 1% 1/8W 100 ppm 1206
R329	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R330	5322 101 14299	Potentiometer, 1 kΩ, 10% 72X
R331	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R332	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R333	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R335	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R336	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R337	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R338	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R339	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R340	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R341	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R342	5322 116 80427	Resistor, 1 kΩ, 1% 1/8W 100 ppm 1206
R343	5322 111 90113	Resistor, 560 Ω, 1% 1/8W 100 ppm 1206
R344	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R345	5322 111 90376	Resistor, 4.70 Ω, 10% 1/4W RC-01 1206
R347	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R348	4822 111 90124	Resistor, 82 Ω, 1% 1/8W 100 ppm 1206
R349	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R350	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R351	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R352	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R353	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206

PM 9608B
1.3 GHz HF Input, cont...

POS	SERVICE CODE	DESCRIPTION
R354	5322 111 90376	Resistor, 4.70 Ω, 10% 1/4W RC-01 1206
R355	4822 111 90357	Resistor, 33 Ω, 1% 1/8W 100 ppm 1206
R356	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R357	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
TS301	5322 130 42567	Transistor, BFQ67 SOT23
TS302	5322 130 42567	Transistor, BFQ67 SOT23
TS303	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS304	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS305	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23
TS306	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23

PM 9615
1.0 GHz HF Input

POS	SERVICE CODE	DESCRIPTION
	5322 321 22313	Cable assy
	5322 447 91672*	Shield
	5322 447 91673*	Shield cover
	5322 401 11256*	Cable clip
BU301	5322 267 60199	Connector, R 114426 SMB
BU302	5322 290 34064	Flat pin, 2.80 mm, E184/8 LESA SN BAND
BU303	5322 267 54195	Connector, 10 pol, 22-15-2106 4455-AC
BU304	5322 290 34064	Flat pin, 2.80 mm, E184/8 LESA SN BAND
C301	5322 122 32531	Capacitor, 100 pF, 5% 50V NP0 0805
C302	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C303	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C304	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C305	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C306	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C307	5322 122 32452	Capacitor, 47 pF, 5% 50V NP0 0805
C308	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C310	5322 122 32287	Capacitor, 4.70 pF, 5% 50V NP0 0805
C311	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C312	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C313	5322 122 32481	Capacitor, 15 pF, 5% 50V NP0 0805
C314	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C316	5322 122 33063	Capacitor, 2.20 pF, 5% 50V NP0 0805
C317	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C318	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C319	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805

PM 9615

1.0 GHz HF Input, cont...

POS	SERVICE CODE	DESCRIPTION
C320	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C321	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C322	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C323	5322 122 32446	Capacitor, 470 nF, 20% 50V X7R 2220
C324	5322 122 34123	Capacitor, 1 nF, 20% 50V X7R 0805
C325	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C326	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
C327	5322 122 34098	Capacitor, 10 nF, 20% 50V X7R 0805
GR303	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR304	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR305	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR306	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR307	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR308	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
GR309	5322 130 31544	Diode, 0.03 A, BAT17 SOT23
GR311	5322 130 80246	Diode, BAR 16-1 SOT23
GR313	5322 130 34337	Diode, 0.10 A, BAV99 SOT23
IC301	5322 209 71557	IC, UPC1652G SO-8
IC302	5322 209 71554	IC, SAB1256P /256 DIL-8
IC303	5322 209 71553	IC, NE532D DUAL SO-8
L301	5322 157 52986	Choke, 0.10 µH, 10% MLF3216DR10K
L307	5322 157 52986	Choke, 0.10 µH, 10% MLF3216DR10K
R301	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R302	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R303	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R304	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R305	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R306	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R307	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R308	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R309	4822 111 90186	Resistor, 22 Ω, 1% 1/8W 100 ppm 1206
R310	4822 111 90154	Resistor, 270 Ω, 1% 1/8W 100 ppm 1206
R311	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R312	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R313	4822 111 90397	Resistor, 8.20 Ω, 10% 1/4W RC-01 1206
R314	5322 116 80431	Resistor, 150 Ω, 1% 1/8W 100 ppm 1206
R315	4822 111 90397	Resistor, 8.20 Ω, 10% 1/4W RC-01 1206
R316	5322 116 80433	Resistor, 220 Ω, 1% 1/8W 100 ppm 1206
R319	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R320	5322 111 90095	Resistor, 10 Ω, 1% 1/8W 100 ppm 1206
R321	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R322	5322 116 80448	Resistor, 47 Ω, 1% 1/8W 100 ppm 1206
R324	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R325	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R326	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206
R327	5322 116 80434	Resistor, 2.20 kΩ, 1% 1/8W 100 ppm 1206
R328	4822 111 90154	Resistor, 270 Ω, 1% 1/8W 100 ppm 1206
R329	5322 116 80438	Resistor, 330 Ω, 1% 1/8W 100 ppm 1206
R330	5322 101 14299	Potentiometer, 1 kΩ, 10% 72X
R331	5322 116 80446	Resistor, 47 kΩ, 1% 1/8W 100 ppm 1206

PM 9615
1.0 GHz HF Input, cont...

POS	SERVICE CODE	DESCRIPTION
R332	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R333	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R335	5322 116 80429	Resistor, 100 kΩ, 1% 1/8W 100 ppm 1206
R336	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R337	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R338	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R339	5322 116 80439	Resistor, 3.30 kΩ, 1% 1/8W 100 ppm 1206
R340	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R341	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R342	5322 116 80427	Resistor, 1 kΩ, 1% 1/8W 100 ppm 1206
R343	5322 111 90113	Resistor, 560 Ω, 1% 1/8W 100 ppm 1206
R344	5322 116 80426	Resistor, 100 Ω, 1% 1/8W 100 ppm 1206
R345	5322 111 90376	Resistor, 4.70 Ω, 10% 1/4W RC-01 1206
R347	5322 116 80444	Resistor, 470 Ω, 1% 1/8W 100 ppm 1206
R348	4822 111 90339	Resistor, 120 Ω, 1% 1/8W 100 ppm 1206
R349	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R350	5322 116 80437	Resistor, 2.70 kΩ, 1% 1/8W 100 ppm 1206
R351	5322 116 80441	Resistor, 33 kΩ, 1% 1/8W 100 ppm 1206
R352	5322 116 80445	Resistor, 4.70 kΩ, 1% 1/8W 100 ppm 1206
R353	5322 116 80428	Resistor, 10 kΩ, 1% 1/8W 100 ppm 1206
R354	5322 111 90376	Resistor, 4.70 Ω, 10% 1/4W RC-01 1206
TS301	5322 130 42567	Transistor, BFQ67 SOT23
TS302	5322 130 42567	Transistor, BFQ67 SOT23
TS303	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS304	4822 130 60511	Transistor, BC847B 0.1A 45V SOT23
TS305	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23
TS306	5322 130 60508	Transistor, BC857B 0.1A 45V SOT23

DRAWINGS AND DIAGRAMS

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How to read the diagrams

This chapter contains circuit diagrams and component layouts for the PM 6662 and the PM 6669 counters, and furthermore, for their options; PM 9604, PM 9605, PM 9608, PM 9608B, and PM 9615.

The diagrams have been completed with lists containing the IC's used. These lists give information about the use of those pins which are not shown in the diagrams, such as GND and supply voltages.

Signals

The signals in these units are named after what they do, e.g. IDENT is used for identifying the HF input.

Two different types of arrows are used to mark references for continued connection somewhere else in the diagram.

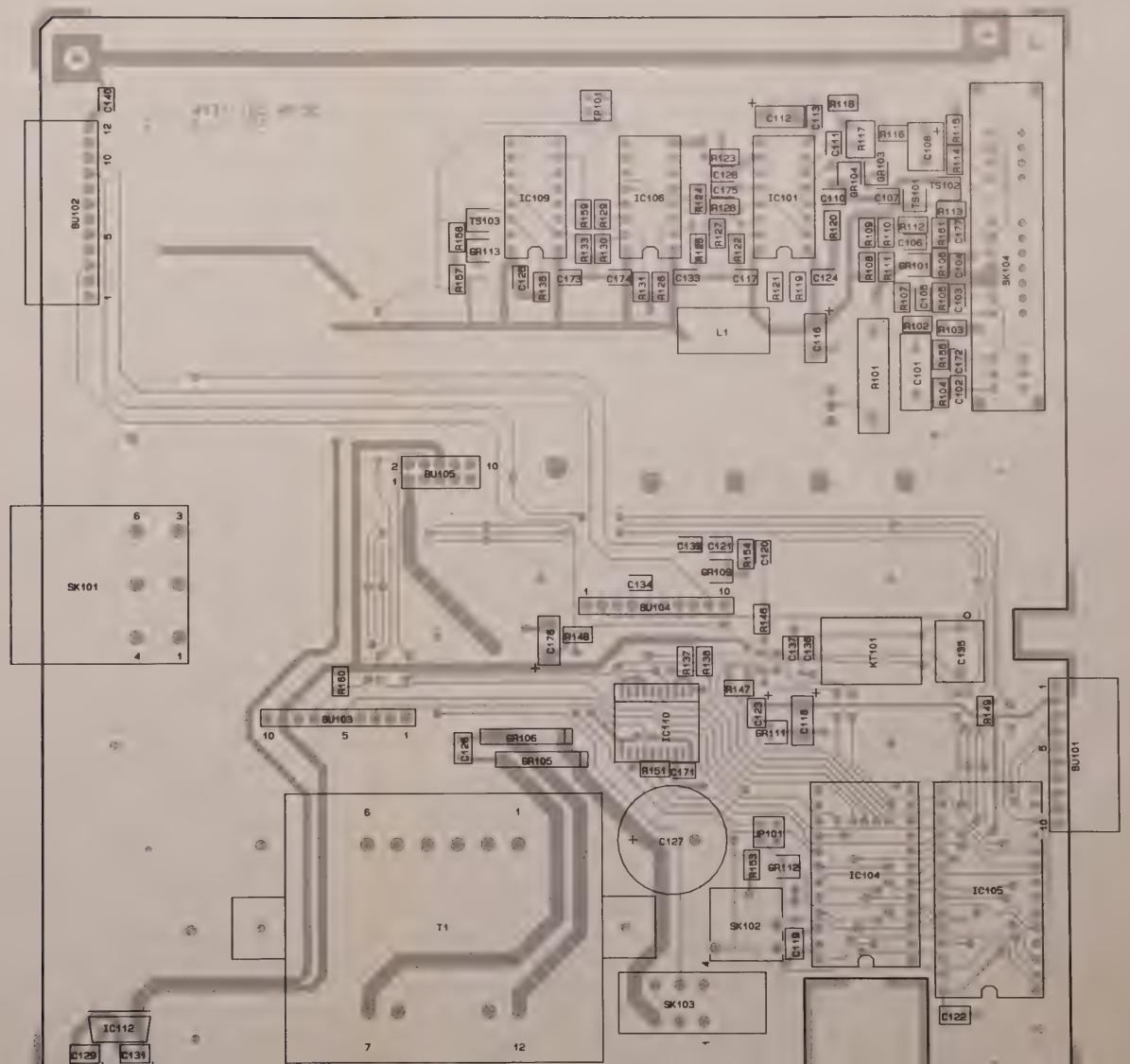
—▷ IC123:4 This arrow is used if the reference is directed to a point located on the same page. The example means connection to IC123, pin 4 (same page).

—▷ 25/IC432:1 This arrow is used if the reference is directed to a point located on another page. The example means connection to IC432, pin 1, page 25.

Coloured areas

The coloured areas in the diagrams represent following functions:

Blue = Integrated circuits
Green = Trim-points or test points
Orange = Connectors


BU102
BU105
BU104
BU103
BU101
SK101
SK104
SK102
SK103
IC109
IC106
IC101
IC110
IC104
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T1
L1
KT101
TS103
TS101
TS102
GR113
GR106
GR105
GR104
GR103
GR101
GR112
GR111
GR109
IP101
C112
C113
C116
C127
C122
C135
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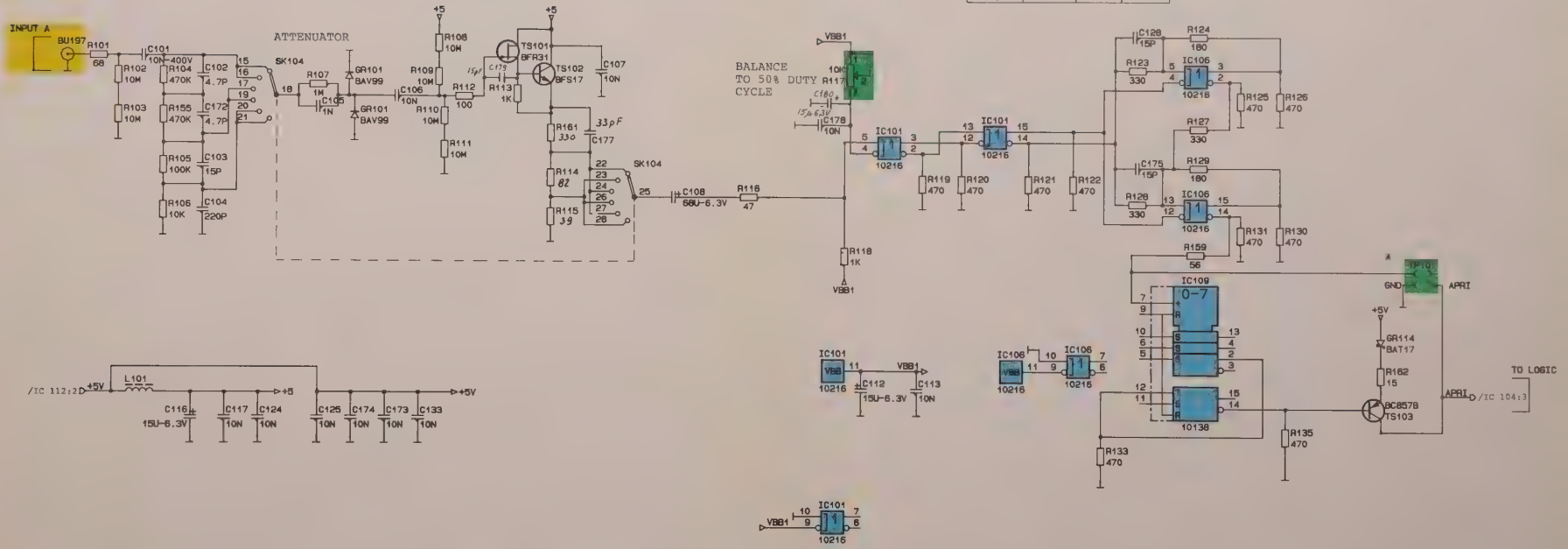
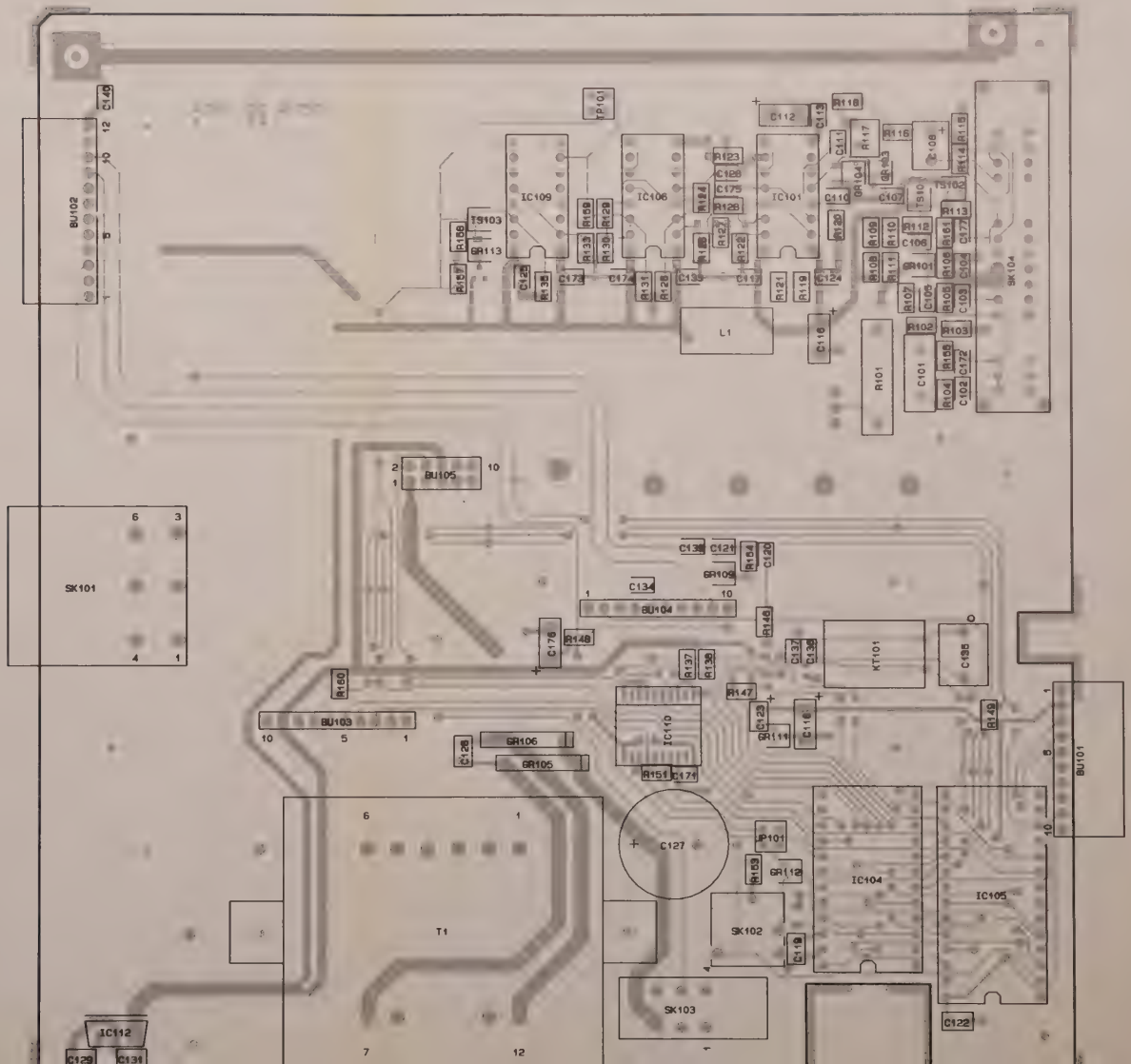
C117
C124
C125
C126
C128
C130
C132
C133
C136
C137
C139
C140
C141
C171
C172
C173
C174
C175
C177
C178

PM 6662 Basic Unit, Input Amplifier

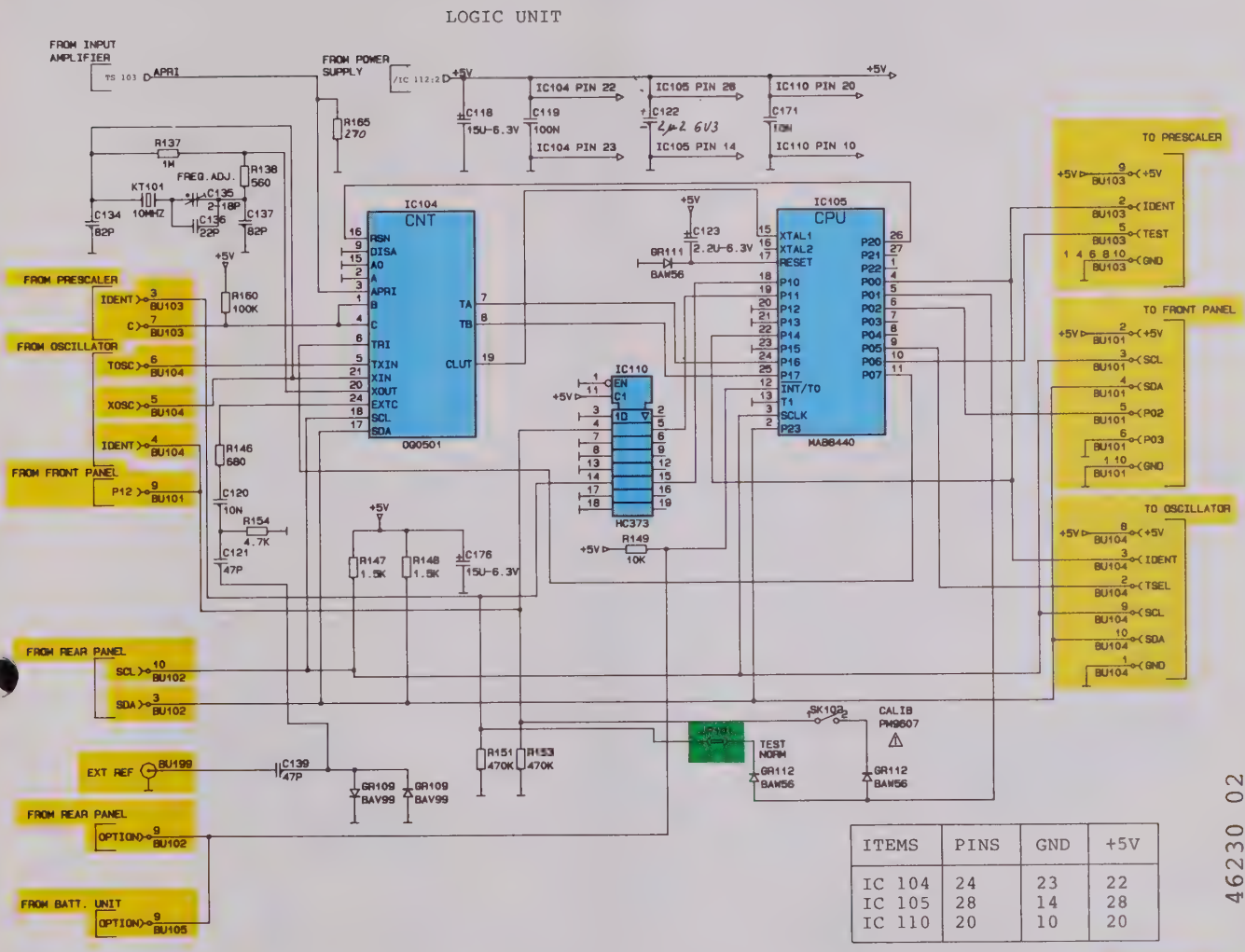
ITEMS	PINS	GND	+5V
IC 101	16	8	1,16
IC 106	16	8	1,16
IC 109	16	8	1,16



PM 6662 Basic Unit

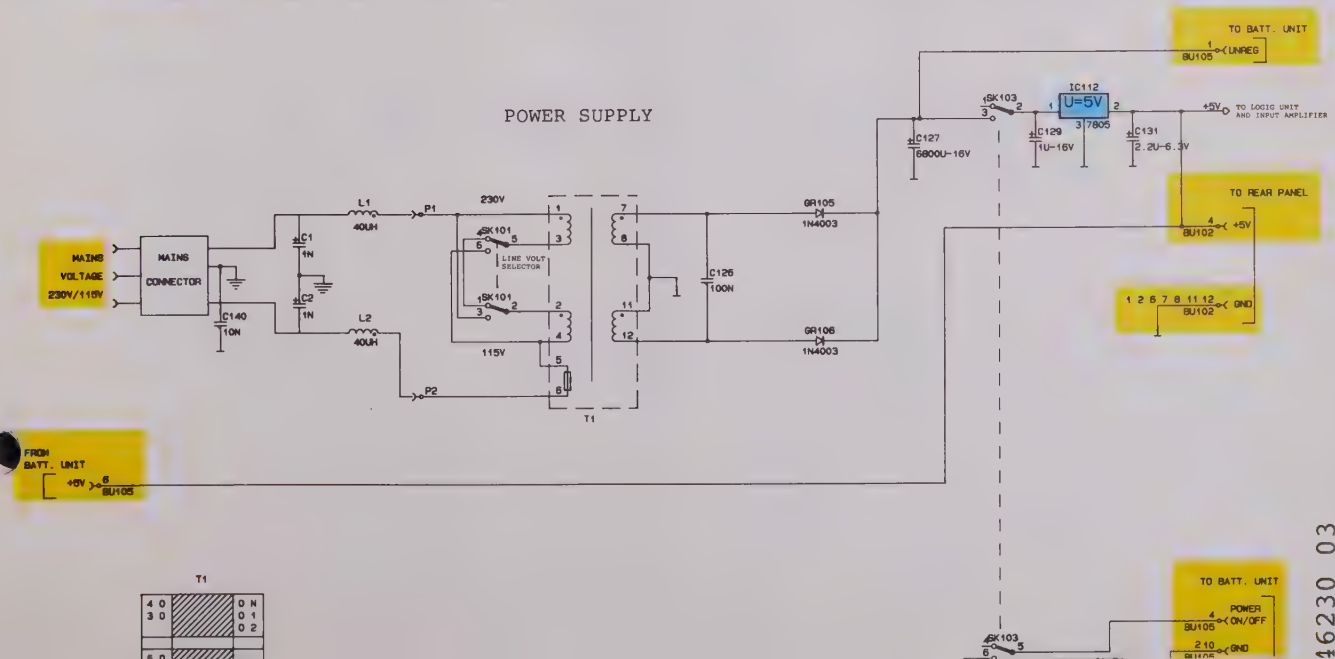


PM 6662 Basic Unit, Logic Unit and Power Supply



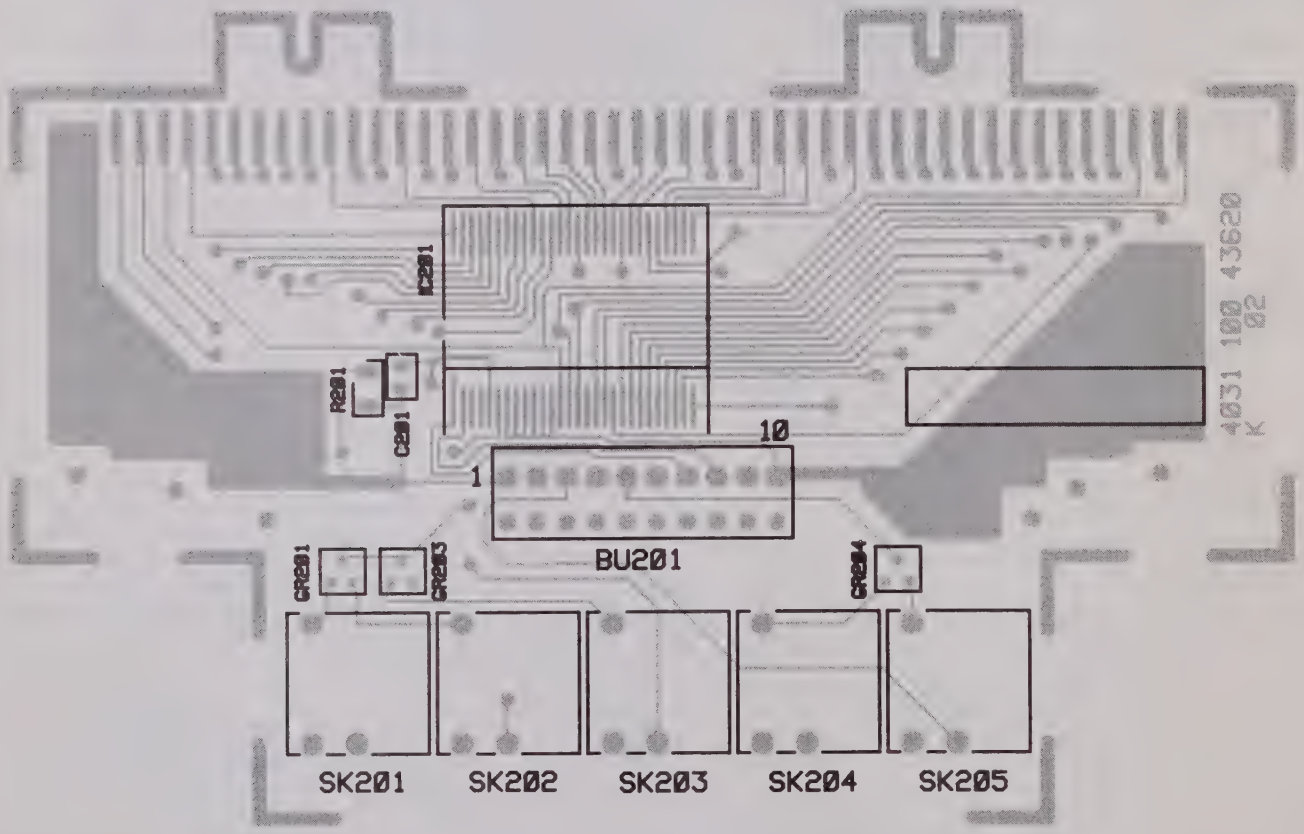
ITEMS	PINS	GND	+5V
IC 104	24	23	22
IC 105	28	14	28
IC 110	20	10	20

46230 02

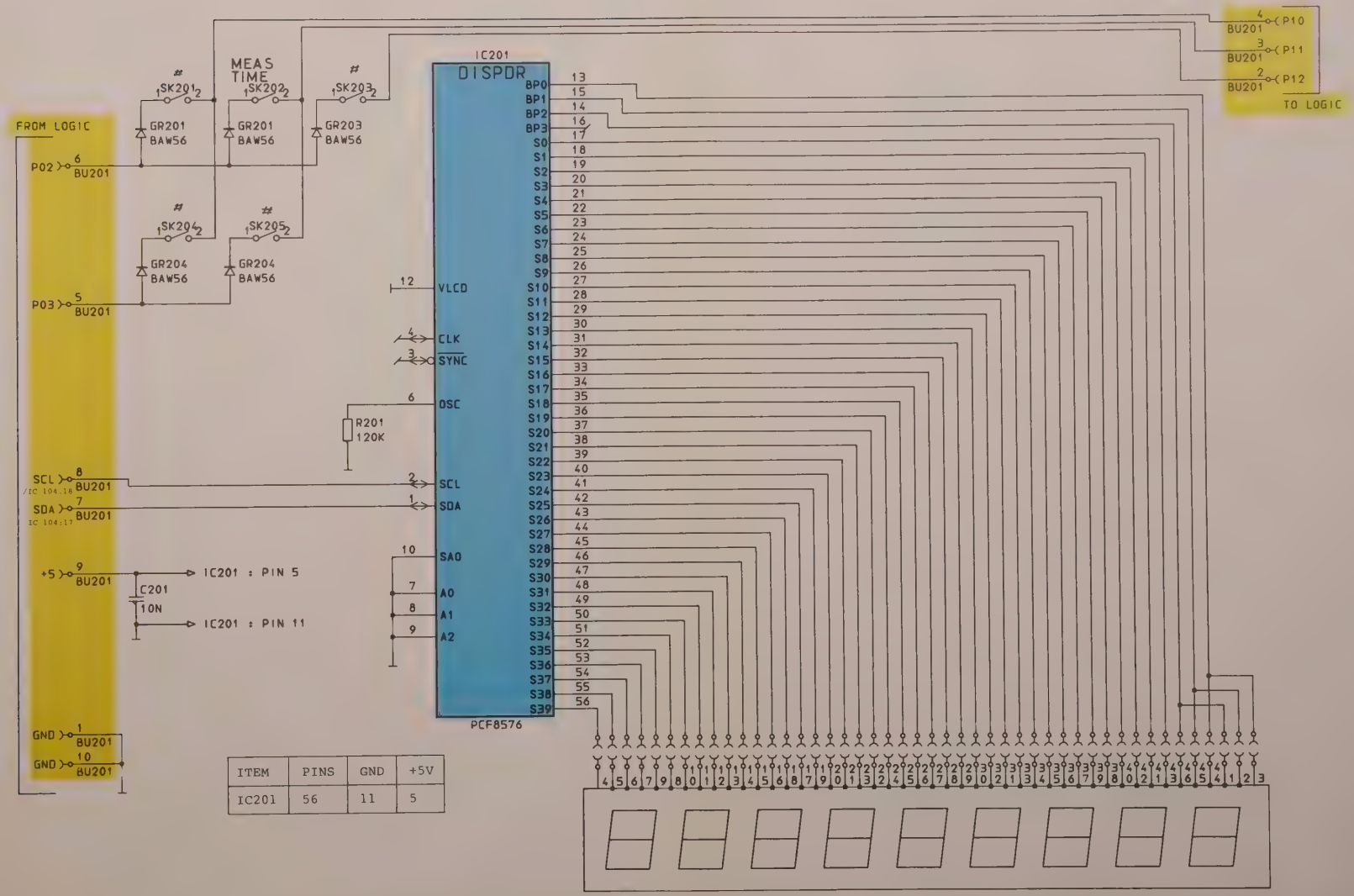


46230 03

PM 6662 Front Panel

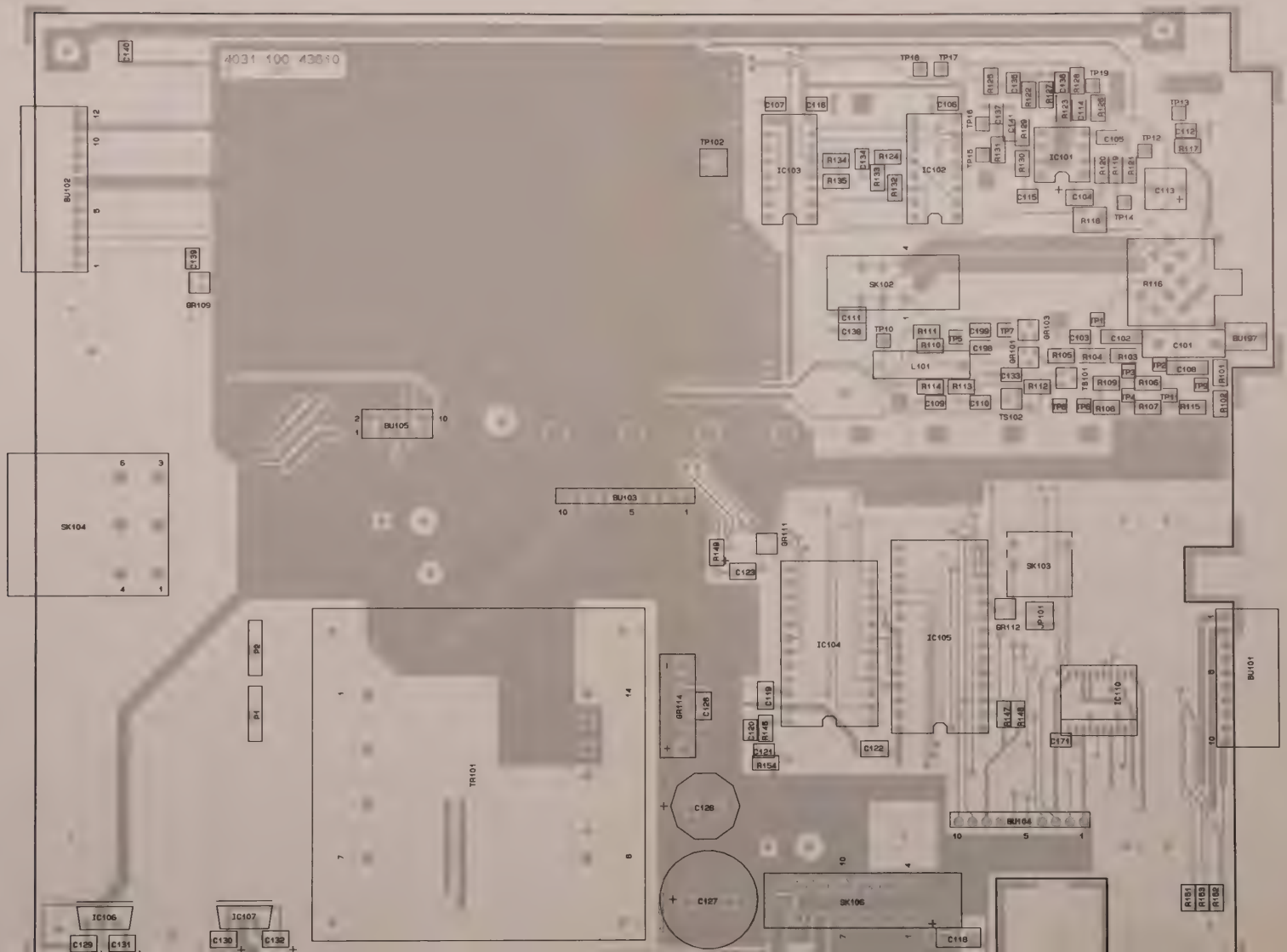


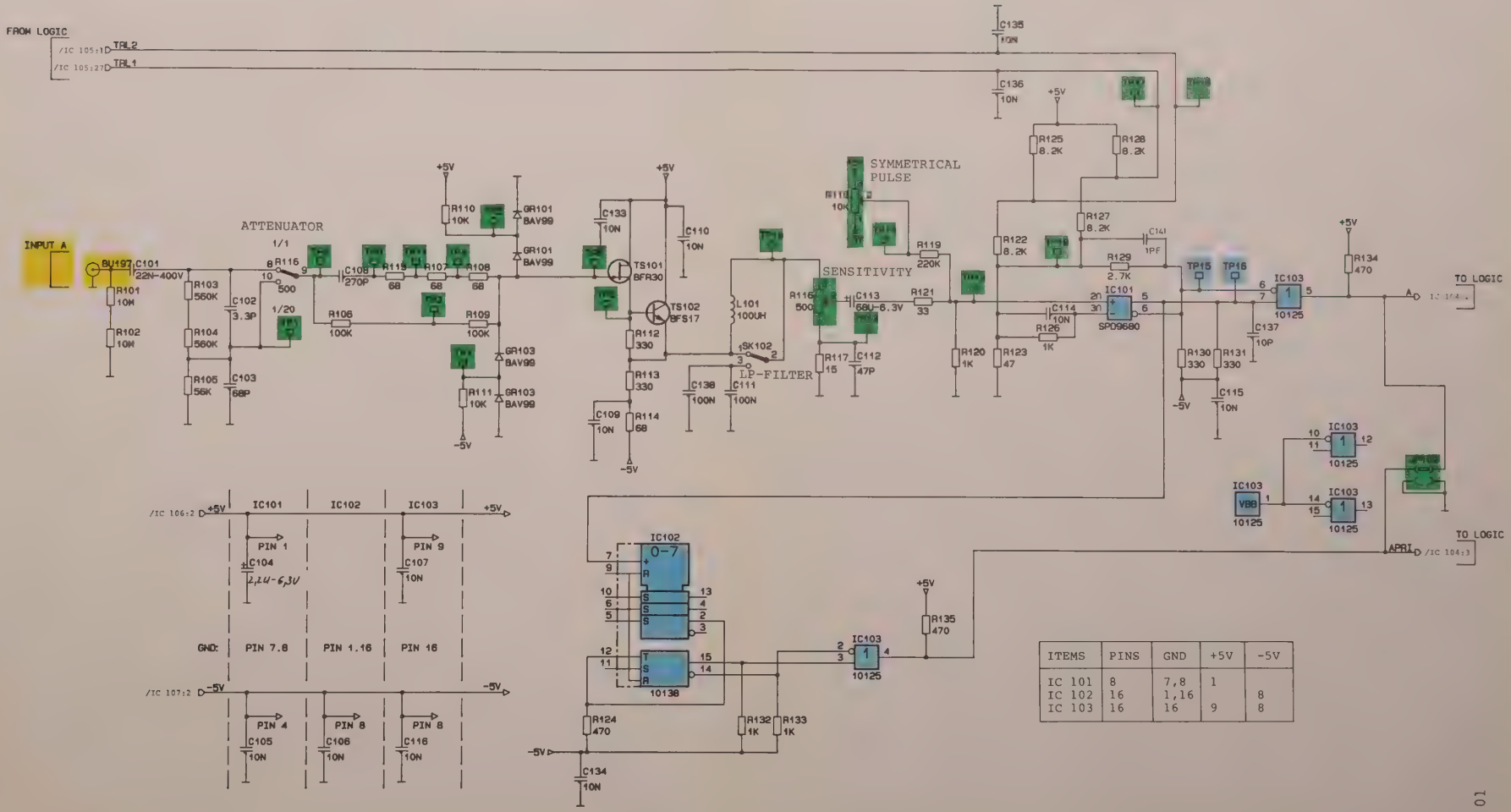
PM 6662 Front Panel



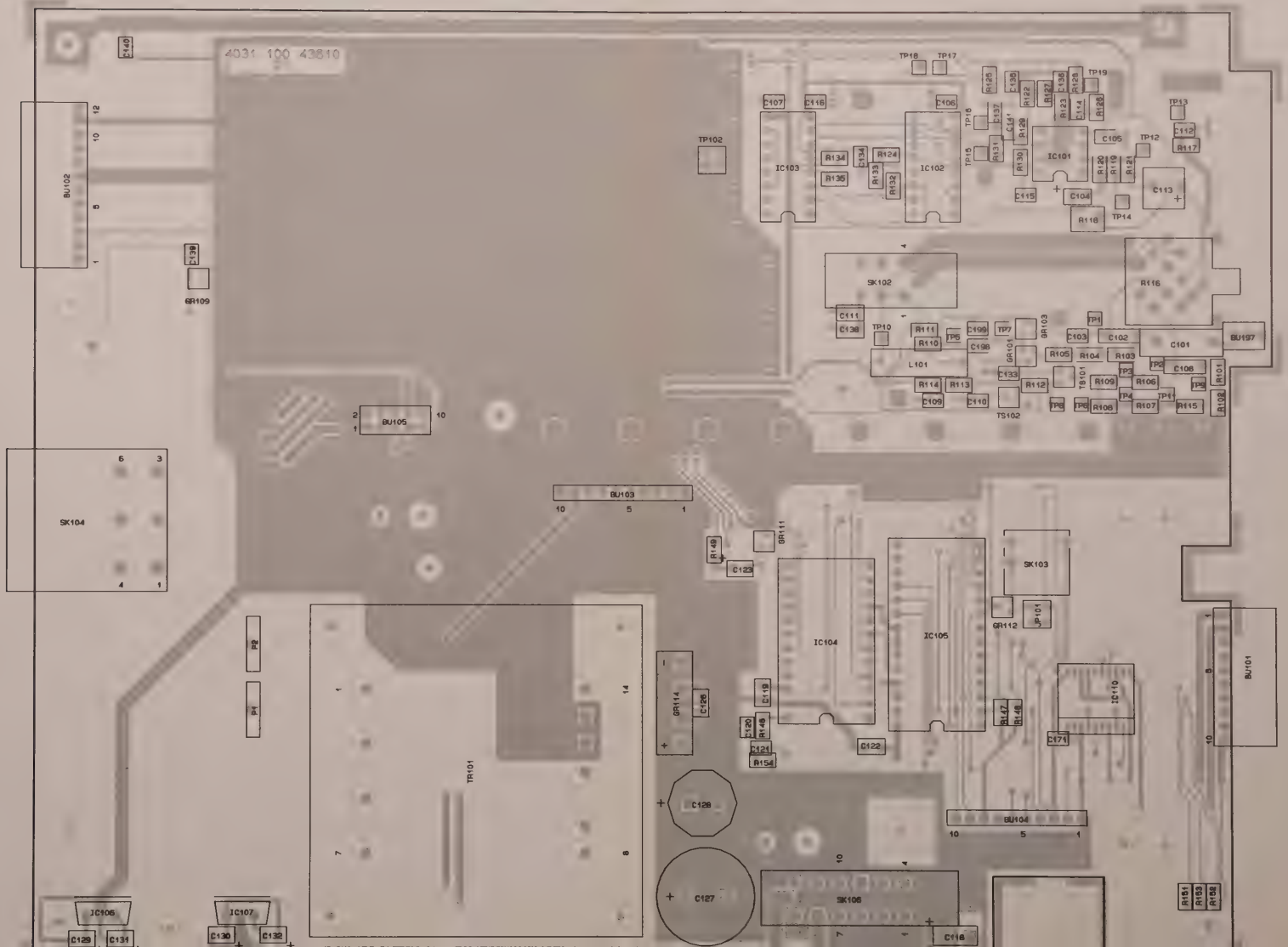
ITEM	PINS	GND	+5V
IC201	56	11	5

PM 6669 Basic Unit





ITEMS	PINS	GND	+5V	-5V
IC 101	8	7,8	1	
IC 102	16	1,16		8
IC 103	16	16	9	8


4031 100 43610
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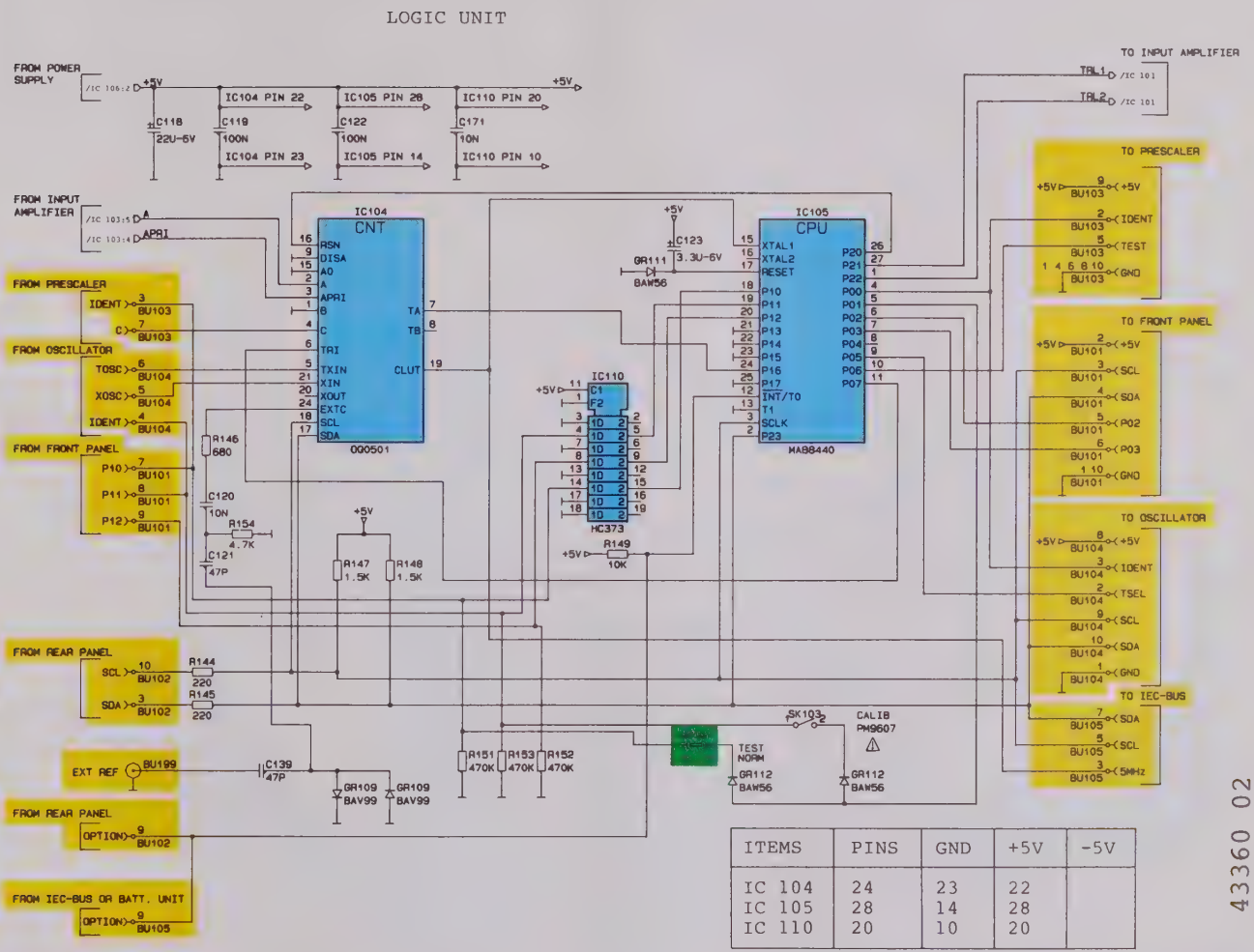
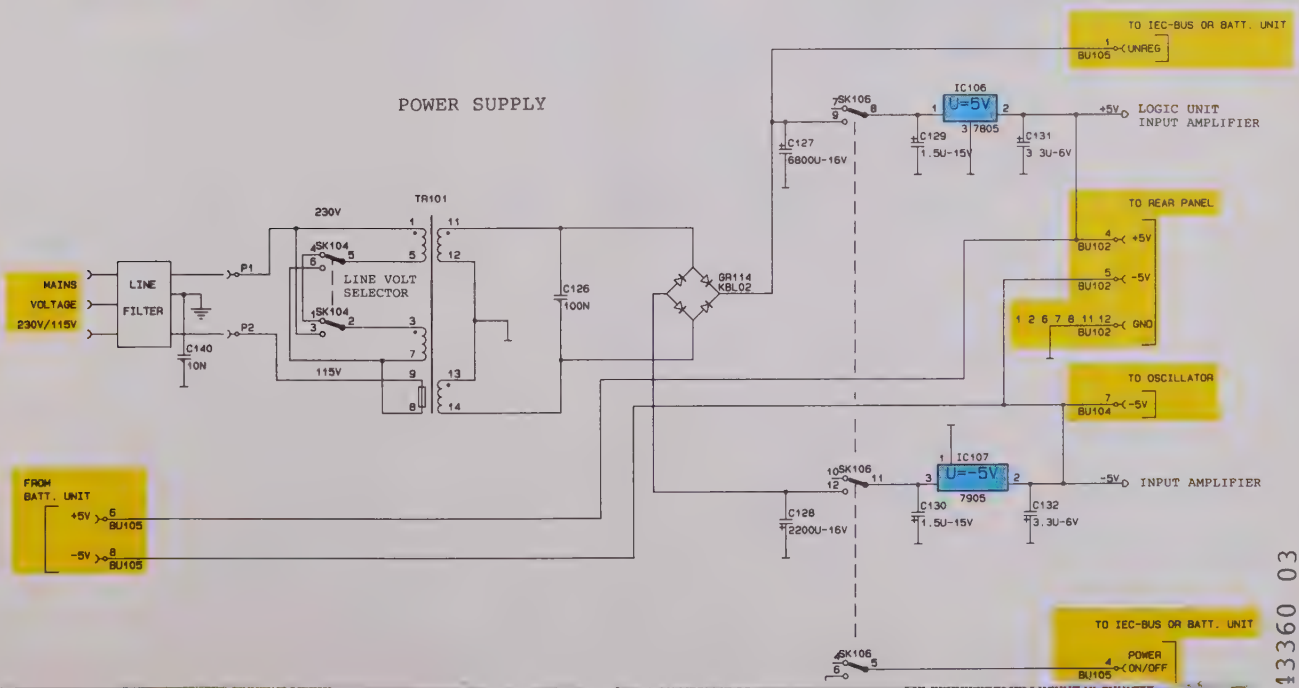
R155
R154
P1
P2
6R109

PM 6669 Basic Unit, Logic Unit and Power Supply



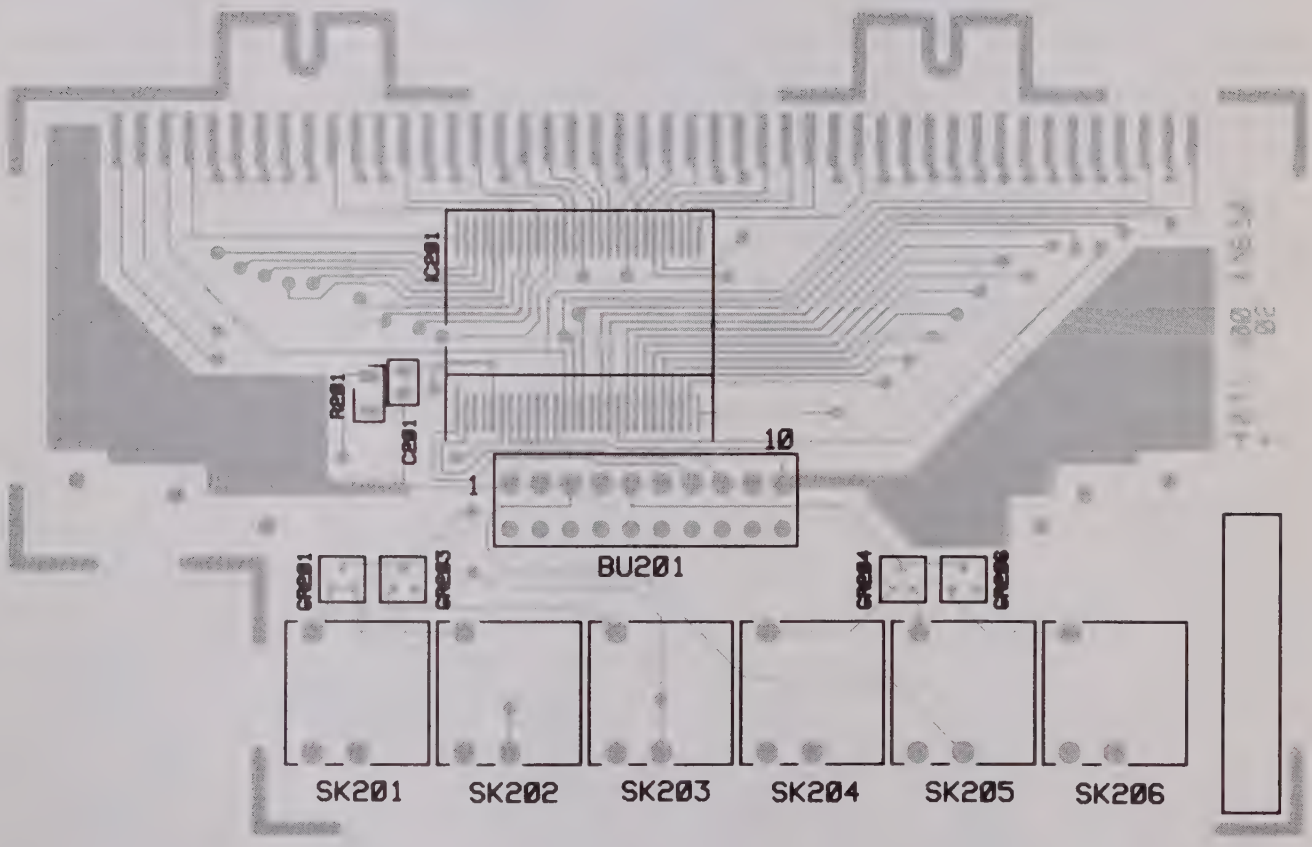
ITEMS	PINS	GND	+5V	-5V
IC 104	24	23	22	
IC 105	28	14	28	
IC 110	20	10	20	

43360 02

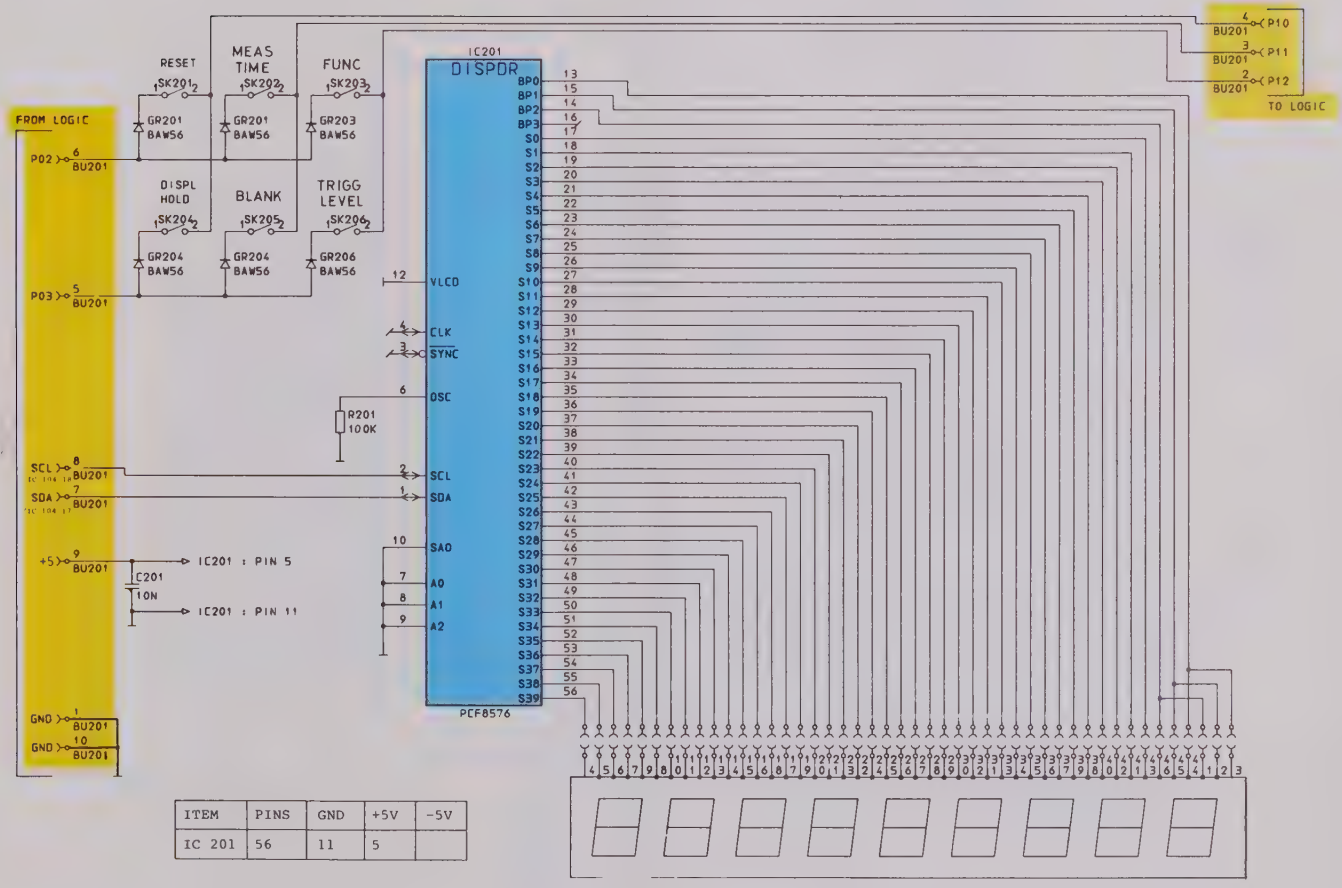


43360 03

PM 6669 Front Panel

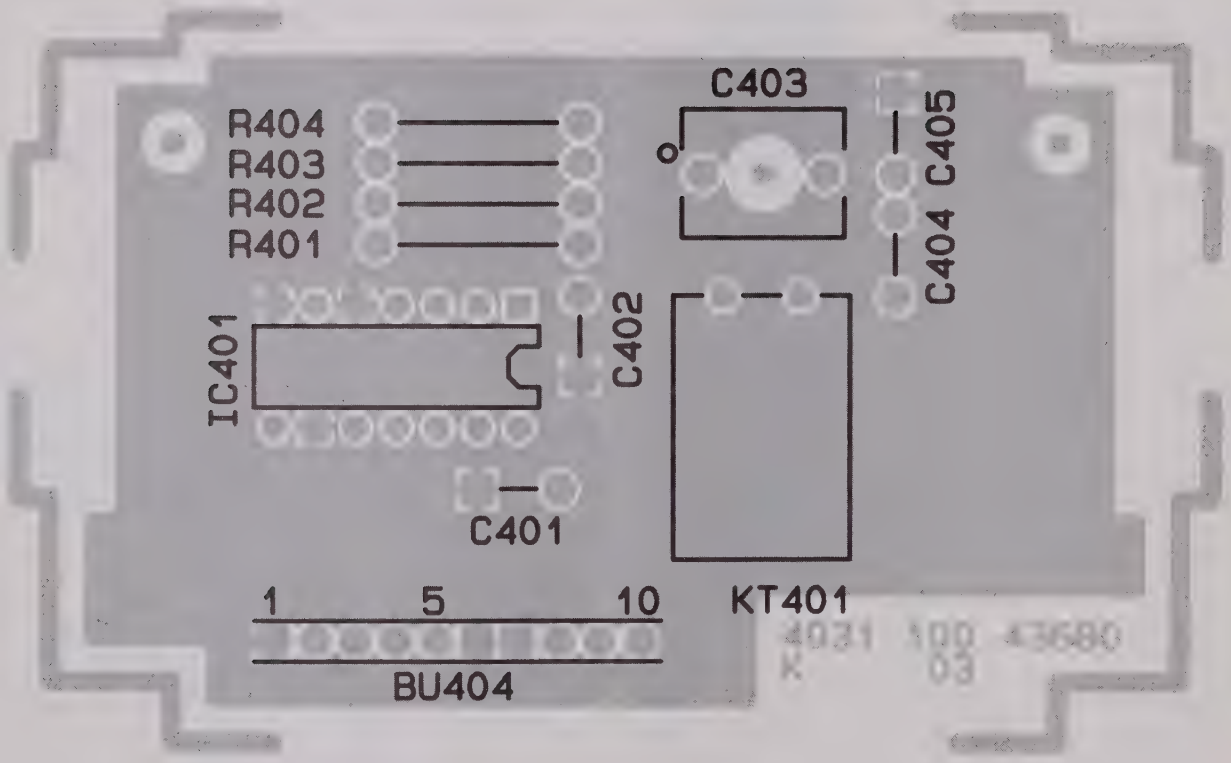


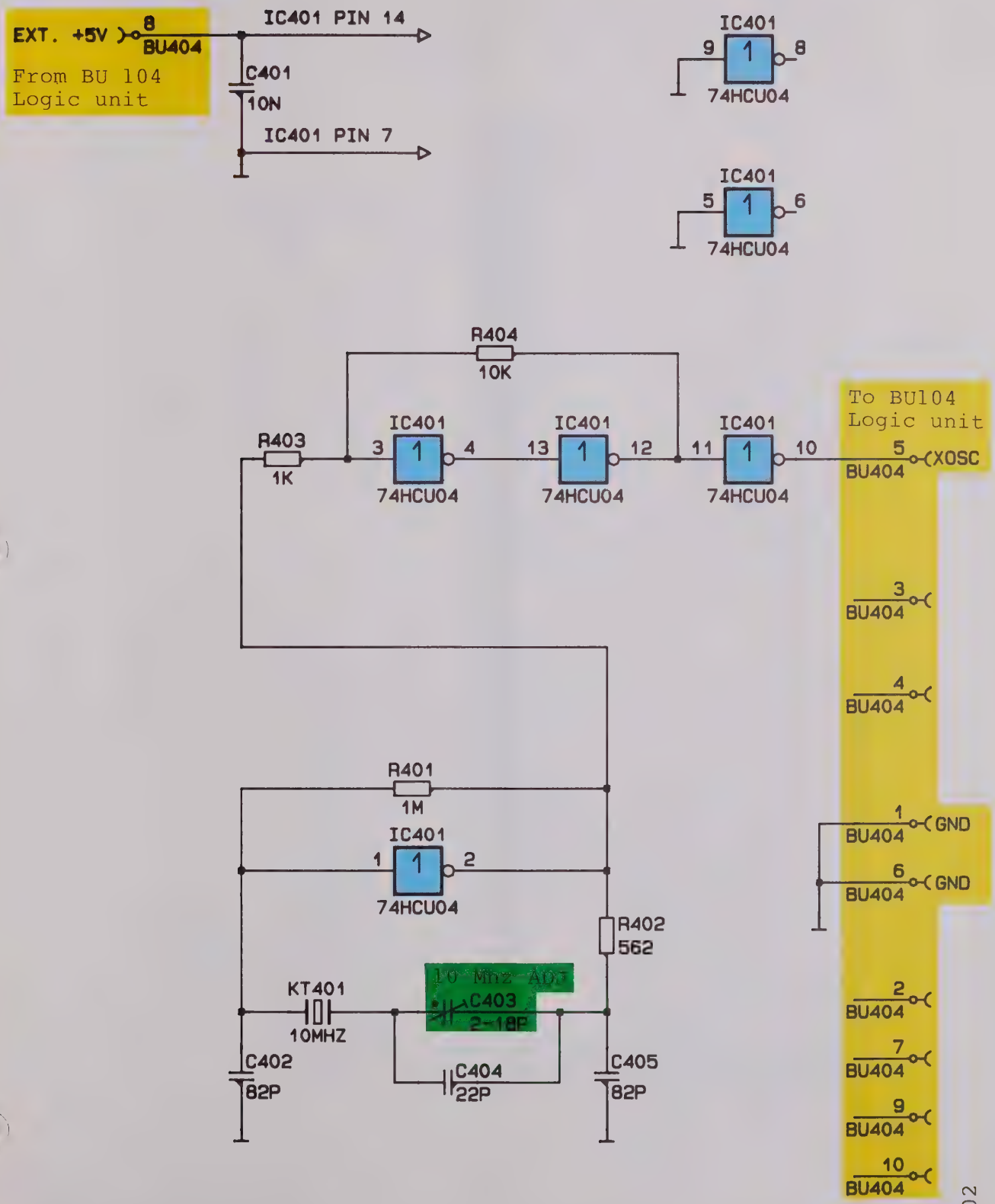
3630 06+02



ITEM	PINS	GND	+5V	-5V
IC 201	56	11	5	

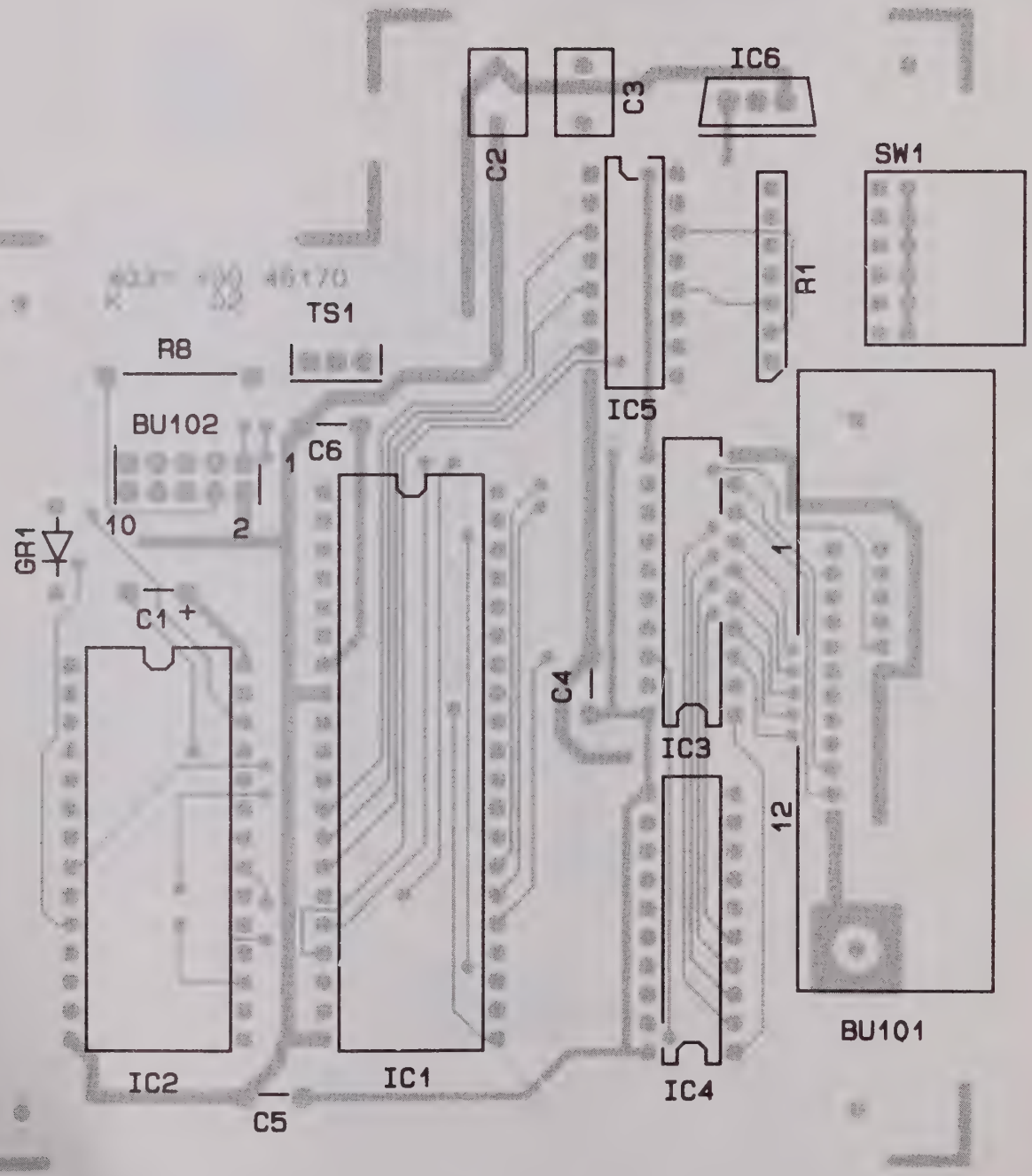
/.1. Oscillator (uncompensated crystal)
PM 6669 Only

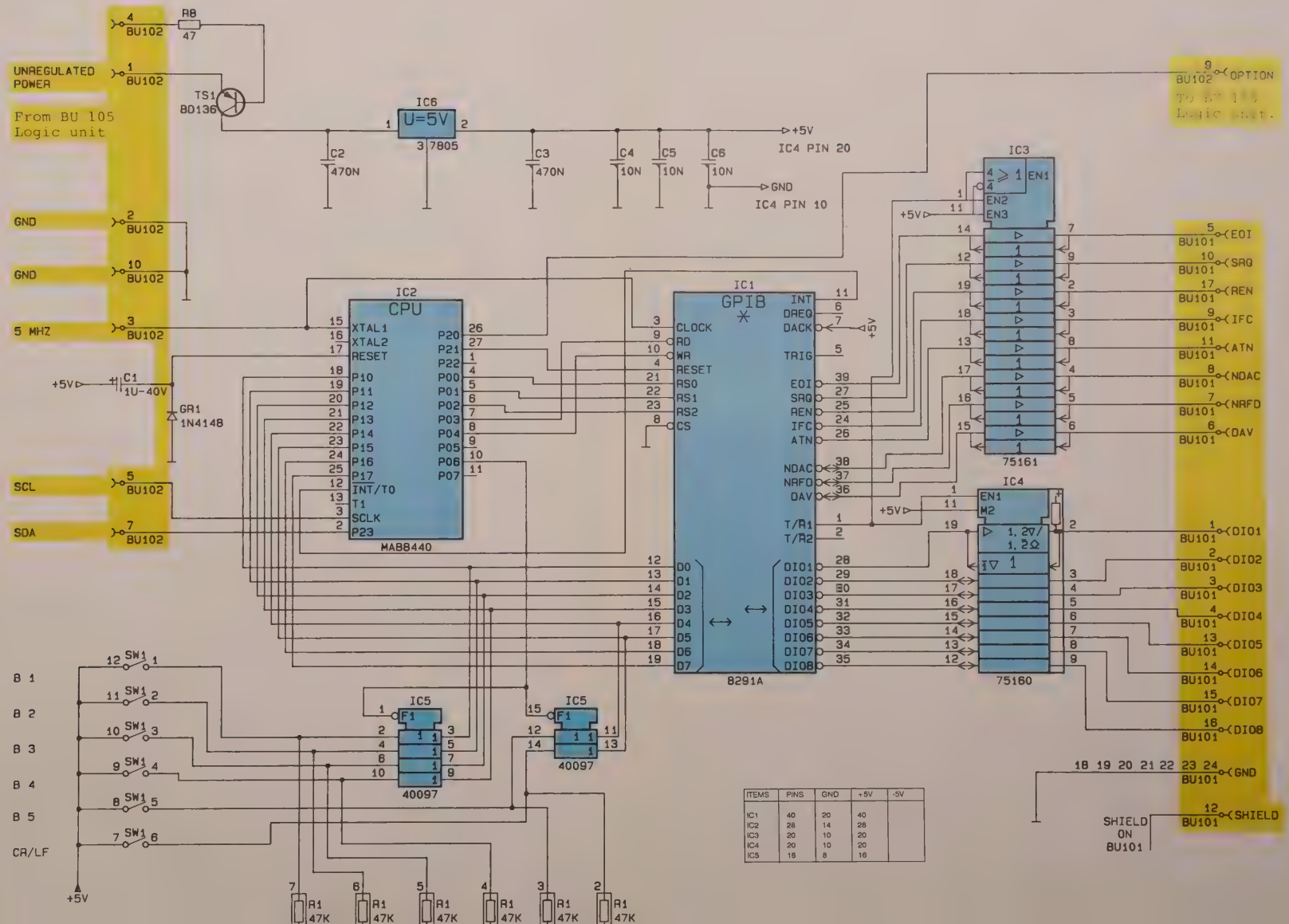




ITEMS	PINS	GND	+5V	-5V
IC401	14	7	14	

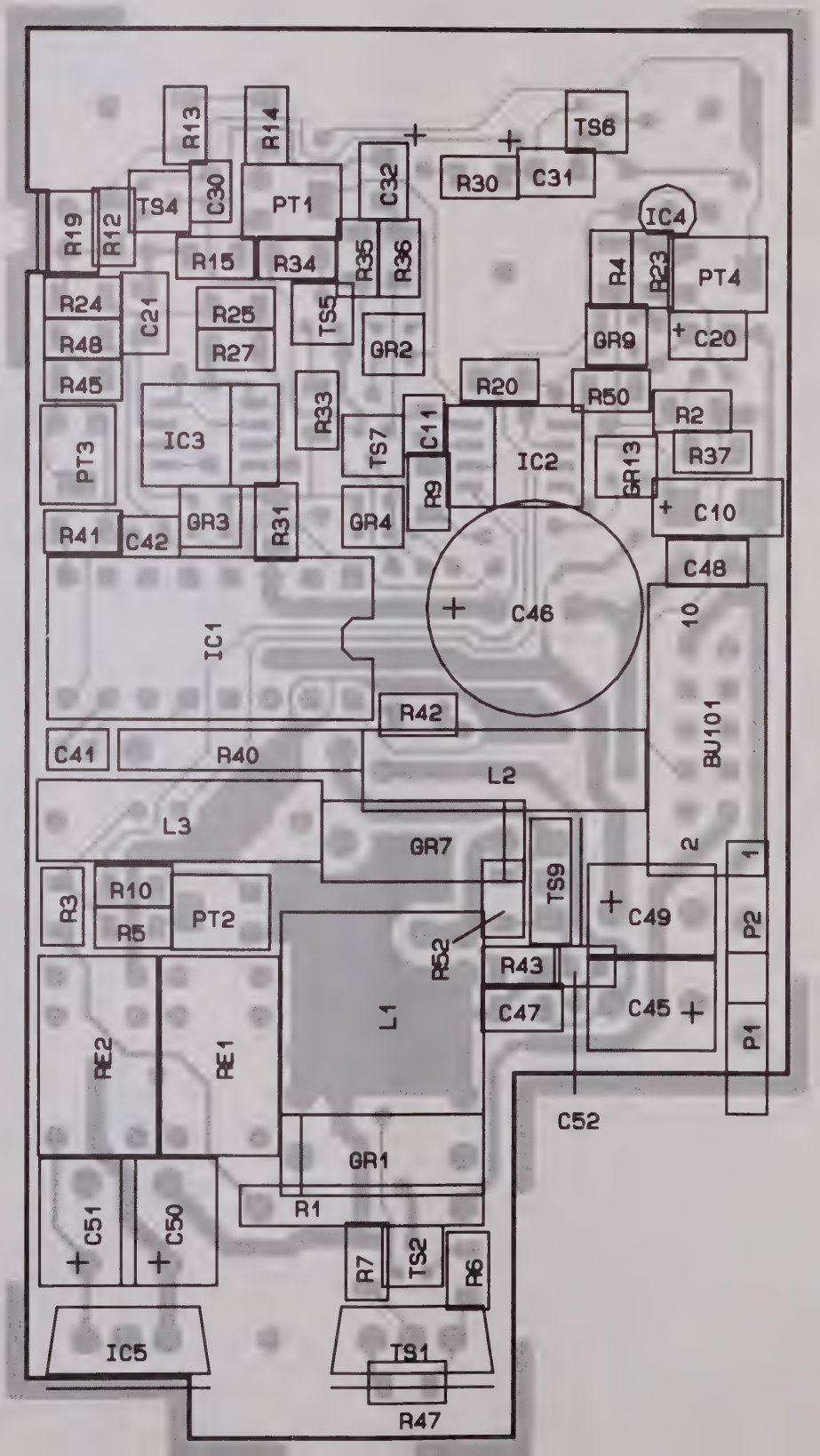
PM 9604 GPIB Interface
PM 6669 Only

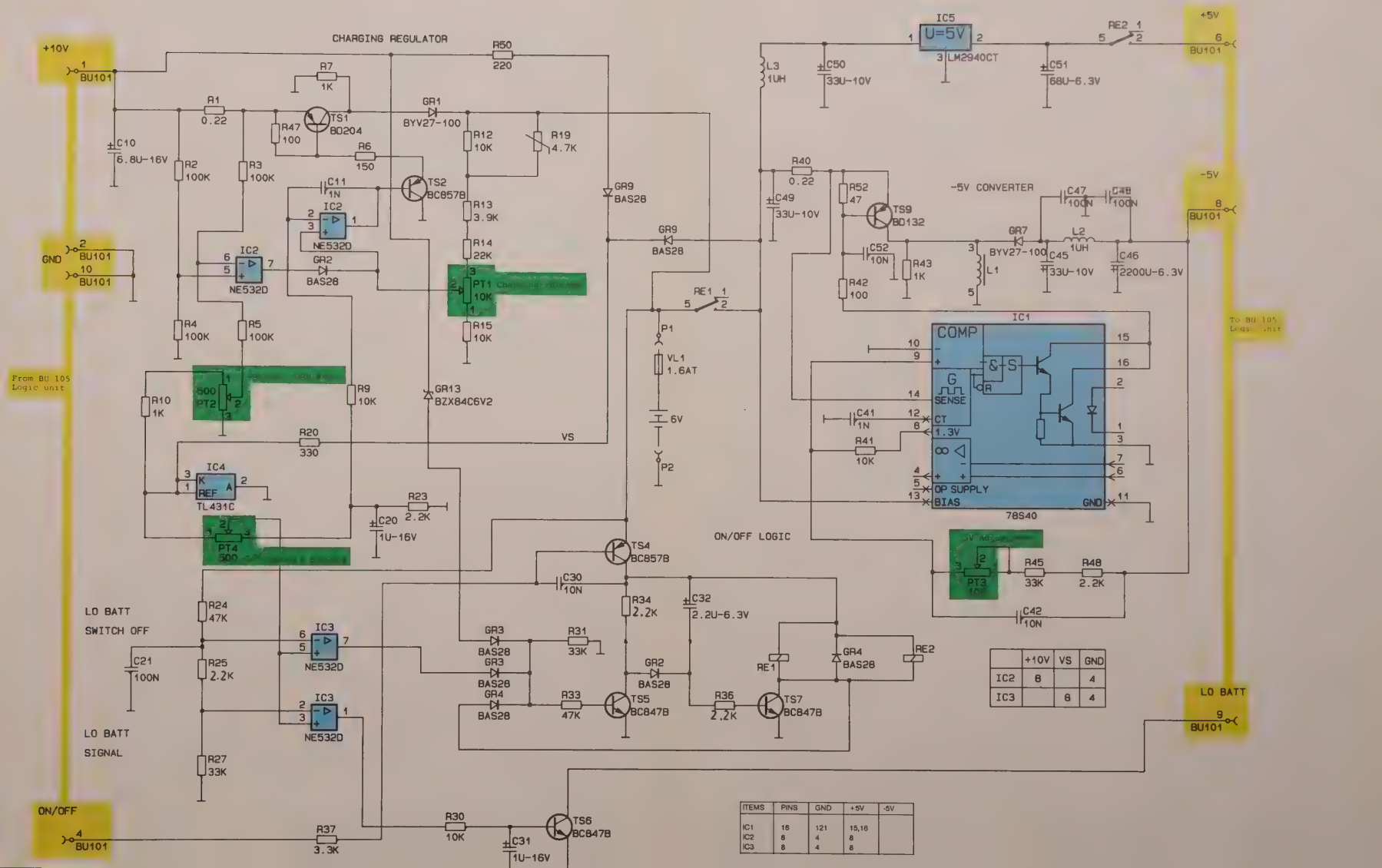




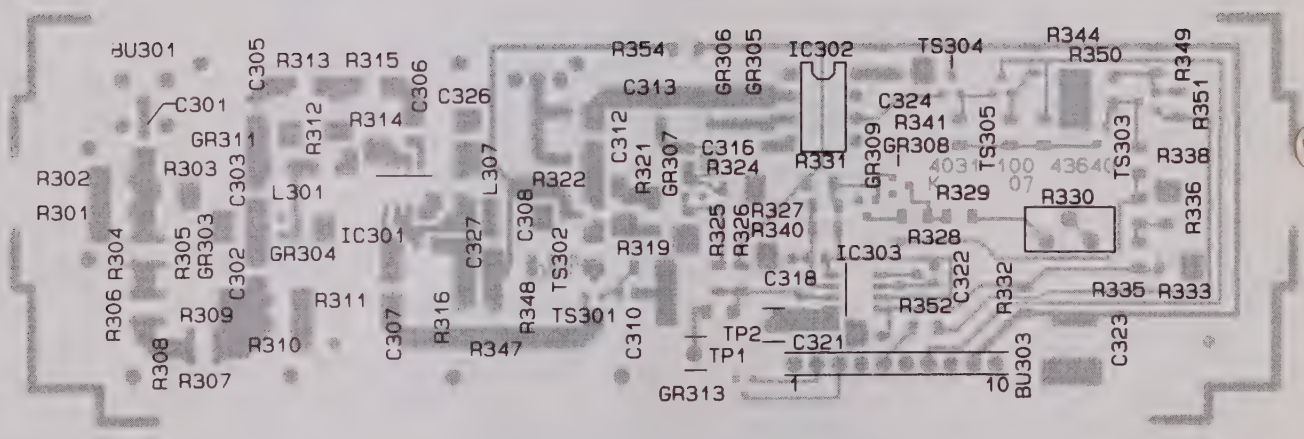
ITEMS	PINS	GND	+5V	-5V
IC1	40	20	40	
IC2	28	14	28	
IC3	20	10	20	
IC4	20	10	20	
IC5	16	8	16	

PM 9605 Battery Unit

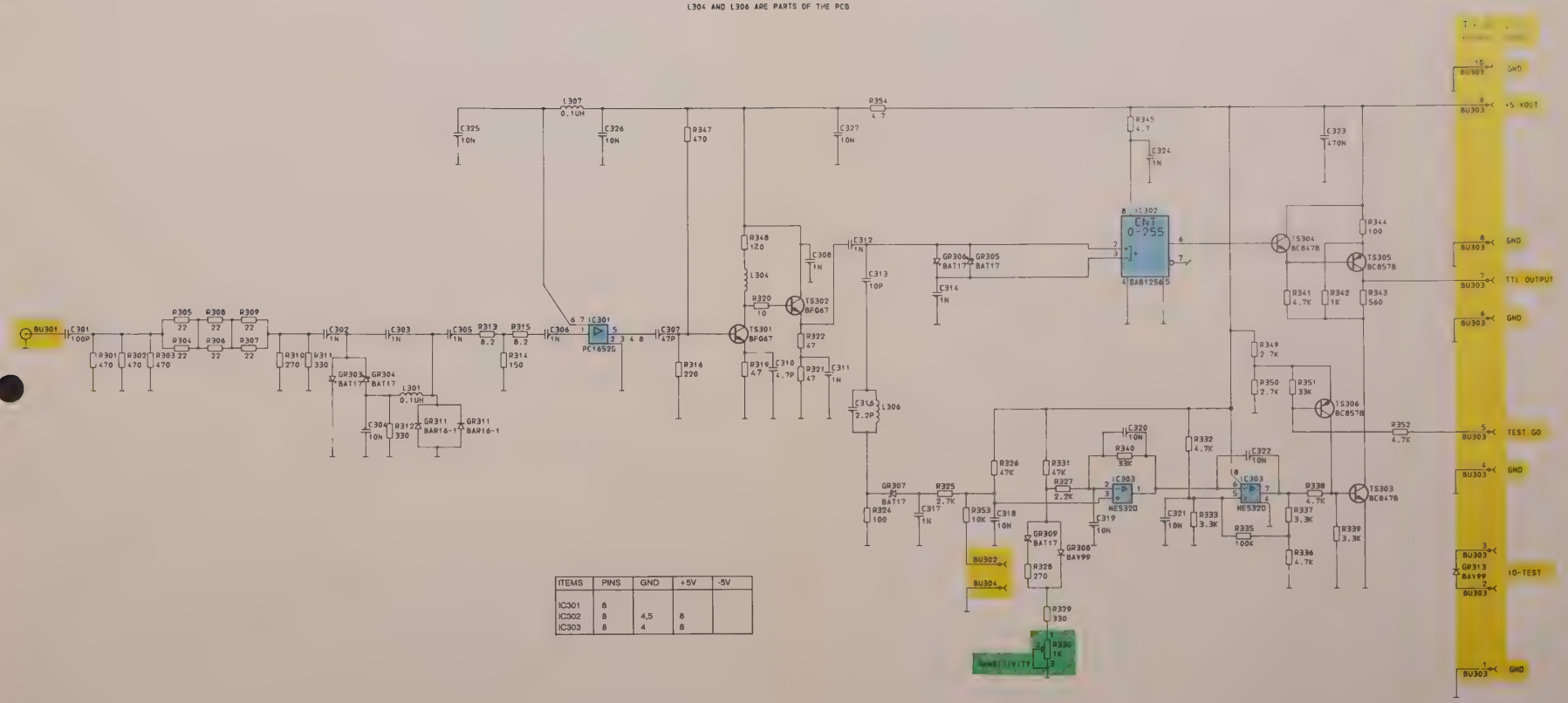



CHARGING REGULATOR
+10V
BU101
GND
R50 220
R7 1K
R1 0.22
TS1 BD204
GR1 BYV27-100
R47 100
R6 150
R12 10K
R19 4.7K
C10 6.8U-16V
R2 100K
R3 100K
C11 1N
IC2
TS2 BC857B
R13 3.9K
GR9 BAS28
NE532D
R14 22K
GR2 BAS28
PT1 10K
R15 10K
R4 100K
R5 100K
From BU 105 Logic unit
500 PT2
R9 10K
GR13 BZX84C6V2
R10 1K
R20 330
VS
IC4
REF
TL431C
R23 2.2K
C20 1U-16V
PT4 500
TS4 BC857B
C30 10N
R34 2.2K
C32 2.2U-6.3V
LO BATT SWITCH OFF
R24 47K
IC3
NE532D
GR3 BAS28
R31 33K
C21 100N
R25 2.2K
GR4 BAS28
R33 47K
TS5 BC847B
R36 2.2K
TS7 BC847B
RE1
GR4 BAS28
RE2
LO BATT SIGNAL
R27 33K
ON/OFF
BU101
R37 3.3K
R30 10K
TS6 BC847B
C31 1U-16V
ON/OFF LOGIC
RE1
P1
VL1 1.6AT
6V
P2
IC5
U=5V
LM2940CT
L3 1UH
C50 33U-10V
C51 68U-6.3V
RE2
+5V
BU101
R40 0.22
C49 33U-10V
R52 47
TS9 BD132
-5V CONVERTER
C47 100N
C48 100N
GR7 BYV27-100
L2 1UH
L1
C45 33U-10V
C46 2200U-6.3V
-5V
BU101
C52 10N
R43 1K
R42 100
IC1
COMP
&
S
R
G
SENSE
CT
1.3V
OP SUPPLY
BIAS
GND
78S40
C41 1N
R41 10K
To BU 105 Logic unit
PT3 10K
R45 33K
R48 2.2K
C42 10N
LO BATT
BU101
ITEMS | PINS | GND | +5V | -5V
IC1 | 16 | 121 | 15,16 |
IC2 | 8 | 4 | 8 |
IC3 | 8 | 4 | 8 |
| | +10V | VS | GND
IC2 | 8 | | 4
IC3 | | 8 | 4

PM 9608 1.1 GHz HF Input

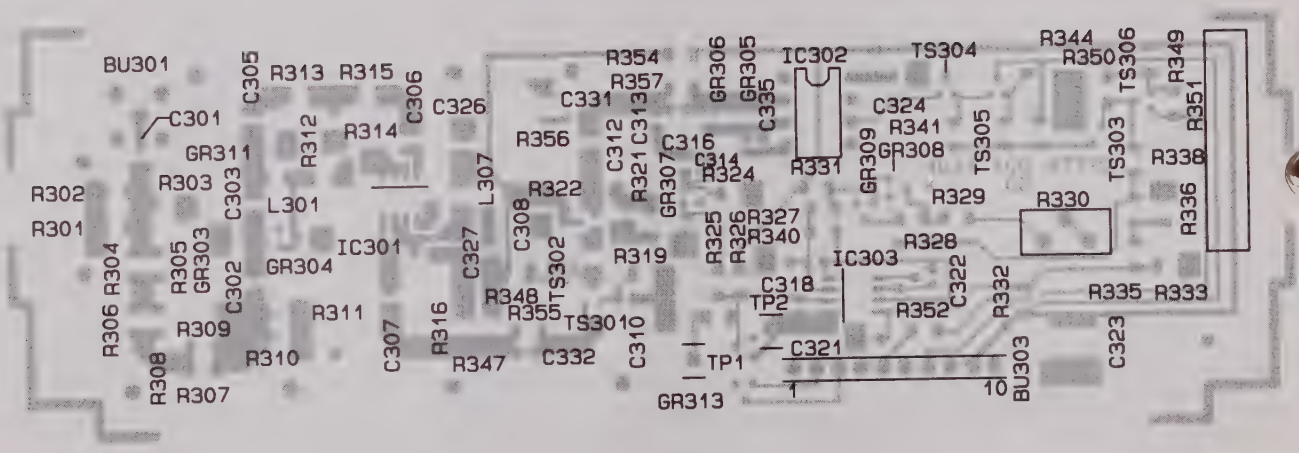


L304 AND L306 ARE PARTS OF THE PCB

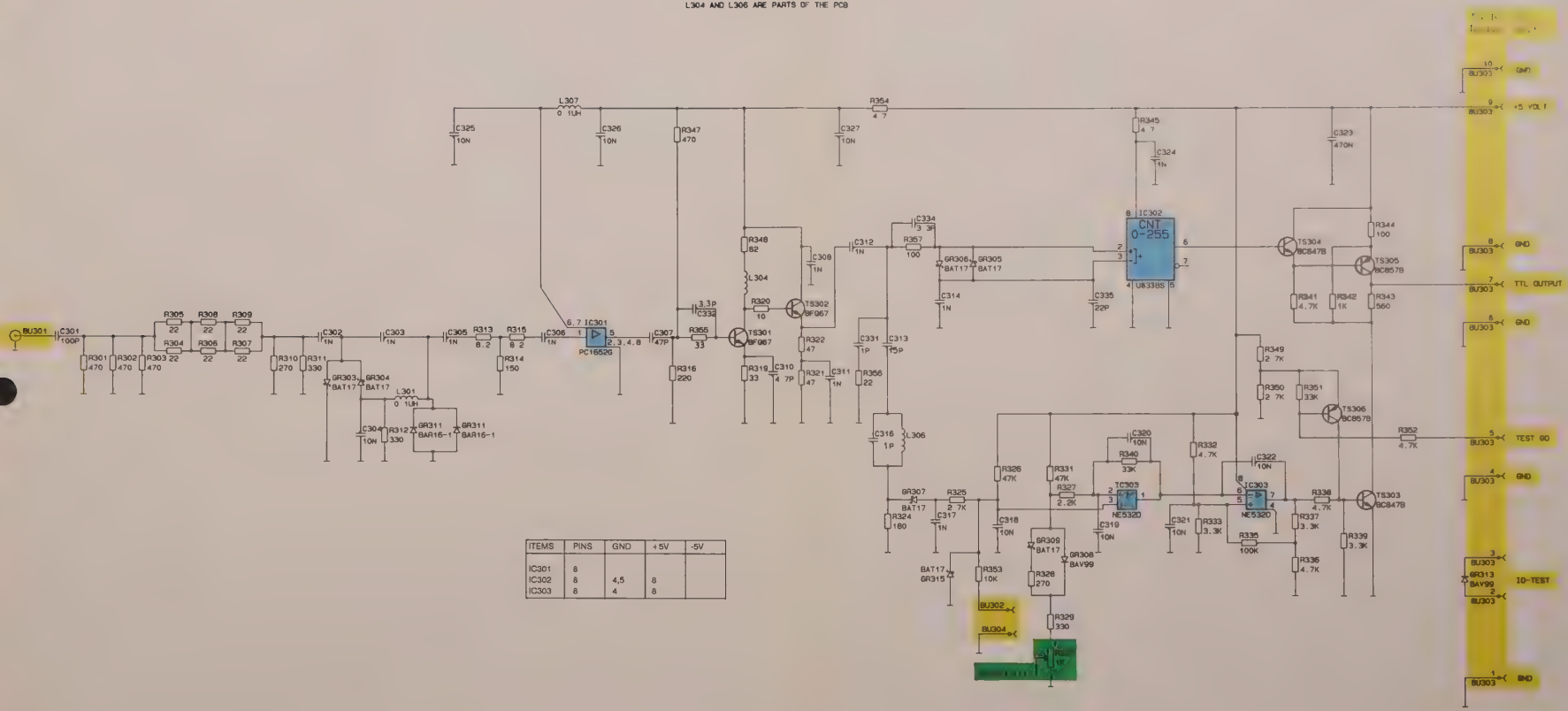


ITEMS	PINS	GND	+5V	-5V
IC301	8			
IC302	8	4,5	8	
IC303	8	4	8	

PM 9608B 1.3 GHz HF Input

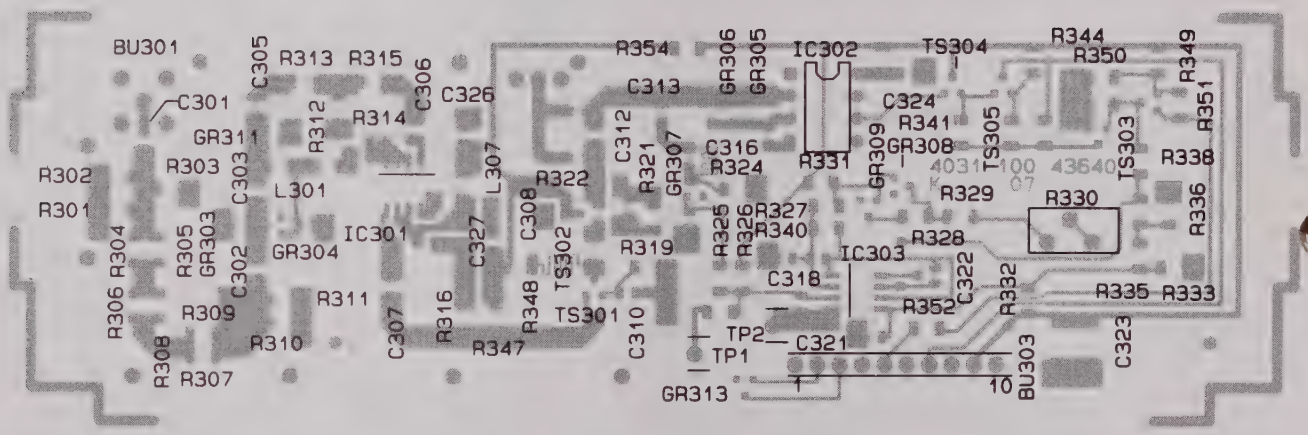


L304 AND L306 ARE PARTS OF THE PCB

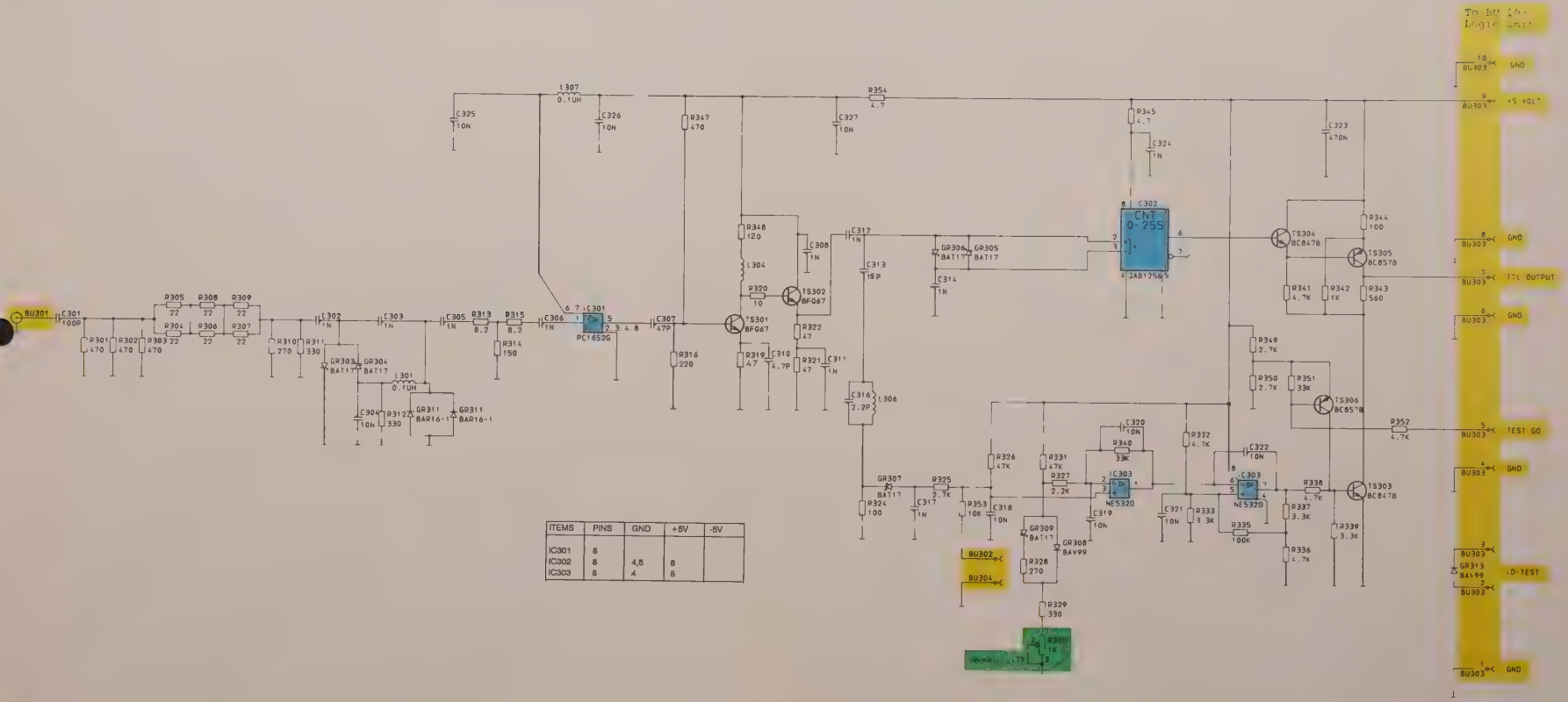


ITEMS	PINS	GND	+5V	-5V
IC301	8			
IC302	8	4,5	8	
IC303	8	4	8	

PM 9615 1.0 GHz HF Input



L304 AND L306 ARE PARTS OF THE PCB



ITEMS	PINS	GND	+5V	-5V
IC301	8			
IC302	8	4,5	8	
IC303	8	4	8	

APPENDIX

Electrostatic Discharge

Almost all modern components have extremely thin conductors and metal oxide layers. If these conductors or oxide layers are exposed to electrostatic discharge they will either break down immediately, or else become damage, which will inevitably lead to breakdown at a later time. The ESD sensitivity of MOS and CMOS components has been known for quite a while, but nowadays, bipolar semiconductors and even precision resistors are ESD sensitive.

Consider all components as being sensitive to electrostatic discharge.

The text below explains how you can minimize the risk of damaging or destroying these devices by being aware of the problems, and leaning how to handle these components.

ESD devices are marked on the packing material of the replacement part with the following symbol:

- Never open the container unless you are at an ESD protected work station.
- Use a wrist strap grounded via a high resistance.
- Use a grounded work mat on your work bench.
- Never let your clothes come in contact with ECD sensitive equipment, even when you are wearing a grounded wrist strap.
- Never touch the component leads.
- Never touch open connectors.
- Use ESD-safe packing materials.
- Use the packing material once only.
- Keep paper and non-conductive plastics materials, etc, away from your workbench. These may block the discharge path to ground.

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Boschdijk 525, Gebouw VB,
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Ned. Antillen: Philips Antillana N.V.,
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New Zealand: Philips New Zealand Ltd.,
Scientific and Industrial Equipment Division,
68-86 Jervois Quay, G.P.O. Box 2097,
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Nigeria: Associated Electronic Products (Nigeria) Ltd.,
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Nippon: NF Trading Co. Ltd.,
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Norge (Norway): Norsk A.S. Philips,
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Philippines: Philips Industrial Development Inc.,
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Portugal: Philips Portuguesa S.A.R.L.,
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Saoudi Arabia: Delegate Office of Philips Industries,
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